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Ministry of Education, Arts and Sciences
Royal Netherlands Academy of Sciences and Humanities
Netherlands Organization for Pure Scientific Research (Z.W.O.)
Central National Council for Applied Scientific Research in the Netherlands (T.N.O.)
Bureau for International Technical Assistance of the Ministry of Foreign Affairs
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Editorial

*In this issue we are asking your special attention for the Central Netherlands Organization for Applied Scientific Research (T.N.O.) which has been putting applied research in the natural sciences at the service of the general community for twenty-five years now. During a meeting called in May last to celebrate this silver jubilee, the Minister of Education, Arts and Sciences delivered a speech which we feel sure every worker in the field of science, whether it be in the natural sciences or in the humanities and social sciences, will read with great interest. We take pleasure, therefore, in reprinting the full text, as originally published in the Ministry of Education, Arts and Sciences' official gazette.*1)

The contribution by Dr. Maria Rooseboom, Directress of the National Museum for the History of Science at Leyden, which has been written specially for this Bulletin, will, we hope, prove of equal interest. Though housed in relatively confined premises, this museum possesses a rich collection of unique objects of historical interest, while the article makes a revelation concerning the famous original of the "Leyden jar", which will probably come as a surprise to many readers.

Finally, we would draw the attention of all concerned to the appeal made at the end of this number.

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1) Ministry of Education, Arts and Sciences Announcements (Mededelingen) Vol. 21, no. 19, pp. 206–7.

CENTRAL NETHERLANDS ORGANIZATION FOR APPLIED SCIENTIFIC RESEARCH (T.N.O.)

To preface the speech delivered by the Minister of Education, Arts and Sciences, we print below a concise account of the aim and method of the T.N.O., contributed by Mr. Th. J. van Kasteel, head of the Organization's Information Division.

(Editors)

On May 1, 1957 it was twenty-five years ago that the T.N.O. made a beginning with the task which is described in the relevant act as: "to ensure that applied research in the natural sciences shall be put at the service of the public in the most appropriate manner".

During the nineteen-twenties the need for putting available knowledge in the natural sciences at the service of the public good, in some systematic fashion, was realized in the Netherlands, as elsewhere. The system adopted to achieve this was voluntary co-operation between science and public life, with government support. Science gives its knowledge; public life its practical skill and experience, while bearing a share of the costs; the Government subsidizes the work and sees that the funds supplied are put to proper use. Accordingly, the different boards of the T.N.O. are composed of men of science, men with practical experience and representatives of the ministries concerned. With regard to the scientific research carried out with a view to later application in practice, the T.N.O. has a central task to perform but enjoys no monopoly: private initiative remains unaffected, though the T.N.O. has a co-ordinating function to fulfil in this respect as well, filling up the gaps and seeing to it that there is no unnecessary duplication of work.

The T.N.O. has its separate special organizations such as that for Industry, Trade and Traffic, that for Food, for National Defence and for Public Health; the National Agricultural Research Council exercises a mainly co-ordinating function as regards work in the farming sector.

The Central Organization of the T.N.O. bridges the whole, providing a centre for co-ordination, while it exercises direct control over a few bodies of very general nature

The T.N.O. has more than 40 centres of work (institutes, working groups and committees). It has about 2,900 persons in its service, 450 of them university men, which figures do not include a large number of men of science and from industrial life, who take part in the T.N.O.'s work as advisers, board members or in some other capacity. In 1956 the T.N.O.'s budget came to about 35 million guilders (approximately £ 3.5 million), 24.5 million being derived from state subsidies, 1.35 million from private contributions and 9 million from work done and services rendered.

25th ANNIVERSARY OF THE T.N.O.

During the meeting held at Scheveningen in May last to commemorate the silver jubilee of the T.N.O., his Excellency Dr. J. M. L. Th. Cals, Minister of Education, Arts and Sciences, delivered a speech, the text of which is printed below.

In the world of science, which reckons its age not in years but in centuries, a 25th anniversary is not in itself a very memorable event. The rate at which things are developing in our century, however, in the world of science as well as in other fields, is so rapid that more history has been made in it so far than in several of the previous centuries put together. Science and technics have set their stamp on what we are accustomed to refer to as western civilization. They have enabled man to curb the forces of nature and to put them at the service of his own well-being, yet at the same time they have unleashed forces which threaten to overmaster him. It was during the first world war that man first consciously devoted a large-scale effort to organizing the sciences. This was done in the first place, of course, with a view to waging war, but, fortunately, its great importance to economic progress in times of peace also became apparent. The research organizations of the various countries date from that period, and it is now 25 years ago that organized science made its début in our country, too, with the setting up of the T.N.O. This concept of "organization" does not, of course, refer to science in the sense of that mental activity whereby we seek to discover the causal relation between things, but rather to the apparatus of science, the accessories necessary to render such mental activity as efficient as possible, the equipment, the contact and the co-operation between scientific practitioners: in short its form. From the government point of view the significance of the T.N.O. lies chiefly in the fact that it is through this organization that the first conscious endeavour has been made to improve the conditions under which scientific research is carried on and to strengthen the ties existing between science and society by passing on to society newly acquired knowledge more quickly.

25 years ago this idea had by no means found general acceptance in our country. The T.N.O.'s difficult early years and the laborious preparatory work which had to be done before the organization could be founded are a clear enough proof of this. Nowadays, however, we can hardly think of a single sphere of life in which science does not play an important role, and with science and society developing as they are in the modern world, it is impossible to imagine there not being a T.N.O. It accordingly seems to me only natural on the occasion of this silver jubilee of the T.N.O. to devote our thoughts for a moment to the altered significance of science in modern society. The government has therefore taken the initiative in convening this meeting, and it would like particularly to express its homage to the T.N.O. and its appreciation for the large body of excellent work that is has done for Dutch society in the past 25 years.

During the previous century it became increasingly clear that a change was taking place in ideas as to the nature and aim of science. On the one hand science was practised for its own sake, while, on the other, it was made to serve a practical aim, a political idea, progress in the economic field, in technics, in recreation and in communications. This twofold view of things can be found reflected in the first article of our Higher Education Act: "Higher Education comprises training and preparation for the independent practice of the sciences or for positions in social life for which an academic education is required". I can think of no better way of summarizing the first point of view than by quoting the words with which Henri Poincaré begins the introduction to his book "La valeur de la Science": "La recherche de la vérité doit être le but de notre activité; c'est la seule fin qui soit digne d'elle". The search for truth: there we have the sole aim worthy of science. The other, more utilitarian, view might, on the other hand, best be illustrated by the words which Stevenson, the inventor of the locomotive, uttered, when numerous questions were put to him in the House of Commons about his machine. He is reported to have said: "I cannot say it, but I will make it".

This antithesis, this division of scientific activity into two separate compartments, is, of course, a highly simplified version of reality. There were all manner of intermediate and mixed forms I cannot go into here. I am also passing over the fact that this division came to the forefront during the 19th century, although its origins lie much further back.

What I would like to mention, however, is that scientific activity which can be put to practical use and which is intended for application obtained the upper hand to an increasing degree. Speculation for the sake of speculation grew further and further remote from life and reality and became involved in all manner of artificial constructions, schemes, logical cerebrations and formalism in ideas. It could not but yield before the utilitarian practice of science, which had such obvious achievements to point to. The latter was, as everyone could see, fruitful and useful to society and was greatly preferred to the sterile fabrications of the other school.

All of you know the mocking self-critisism with which Goethe makes Faust begin his first monologue:

"Habe nun, ach! Philosophie,
Juristerie und Medizin,
Und leider auch Theologie!
Durchaus studiert, mit heiszem Bemühn.
Da steh' ich nun, ich armer Tor!
Und bin so klug als wie zuvor."

In the same way, addressing his poodle, Faust rejects the idea that "in the beginning was the Word", or meaning or power:

". . . . . . Auf einmal seh' ich Rat
Und schreibe getrost: im Anfang war die Tat!"

Action, the building up of a new society, inventions, constructions, the making of useful things, this became the ideal which science began in increasing measure to serve. This involved important consequences for society. For the deeper and wider man's knowledge of nature became, the greater was the possibility of controlling nature, of putting a bridle on her threats, and of using her forces for the progress of mankind. It was in this way that science unleashed the industrial revolution. But since it had broken loose from its spiritual origins, it was not aware of the great mental and social dislocation it had thereby brought about. It is only now that we are properly aware that the one-sided development of the natural and technical sciences and their application to material welfare can lead to dislocation. But mankind is all too ready to stand agape before the miracles of technical science and the riches it can bring, and many forget too easily that man himself is more important than the ownership of many possessions. Science itself also threatens to become the dupe of its own expansion and the unbridled specialization that goes with it. Only the great figures of science are still able, in addition to possessing detailed knowledge of a special field of knowledge, to see its relationship to universal knowledge. The ironical picture of the modern specialist as a person who knows more and more about less and less is certainly not without foundation. Lip service is still paid to the ideal of the unity of the sciences, but this unity is scarcely observed any longer in practice. Universal knowledge has become divided up into a number of separate subjects and men of science have difficulty in agreeing even within the confines of these separate fields. Fortunately, a change of attitude can be observed, not only within the world of science itself, but also in the way in which society is making use of science. Everywhere the walls dividing the various fields from one another are being broken down. It has been impossible to draw an exact dividing line between chemistry and physics for some considerable time now. Biochemistry and biophysics have rendered the line dividing them from biology vague and indistinct. A link between psychiatry and psychology is being forged via physiology. Psychosomatics emphasize the interaction between the mind and the body. Psychology and psychiatry have not confined their attention to analyzing the mind of the individual but are more and more inclined to study man in his relationship to his fellowmen and to his total environment. Here we enter the field of the social sciences, whose specific concern is man and society.

Society, too, is seeking some counterpoise to the dangers of over-specialization. Technical developments have not only given rise to a need for industrial economics but also for industrial sociology and industrial psychology. It has been realized that no problem exists in isolation but that all are interlinked. This comes for a large part from awareness that the power which science places in the hands of man does not only improve the conditions of his existence, but can also lead to his downfall. Science is becoming aware of its social responsibility and this goads it on to help in the search for solutions to social problems which it has itself, unintentionally, created. Every development in the field of science leads sooner or later to practical applications, and these in their turn result in shifts in society which give rise to new problems with which science then has concern itself again. If it is good, science will always be ahead of social developments; it then tries with its powers of analysis to predict the difficulties society is likely to encounter and to point a way to their solution.

Thus at the present moment science is confronted with a decisive choice. It desires to restore the unity which has been lost, yet at the same time it must recognize that specialization has yielded rich fruits and it knows that still more successes and discoveries lie in the offing, which can only be achieved through the *collective* work of *specialized* experts.

In my opinion, the only man who will be capable of finding a way out of the problem is the man who accepts unconditionally that human reason is not satisfied with outward appearances only, does not stop at mere phenomena and cannot be content with an incoherent and fragmentary treatment of the isolated departments which make up the whole of knowledge, but searches instead for the links connecting them, for their causes and effects, and tries to establish the principles which govern them and bind them together into a perfectly harmonious unit. In other words: only he who puts the human spirit's hunger for unity and harmony above the diversity of outward appearances can see the way out.

This is no illusion lacking roots in reality. The human mind is part of reality as well;

its nature and its needs form part of reality as well, which is so important to us, the children of the 20th century. The great law of efficiency which the modern sciences find confirmed in each successive step they make in the realm of matter applies also, and most particularly, to the realm of the mind, to human reason, whose inborn urge towards unity and whose dislike of division and incoherence are no pointless desires, incapable of fulfiment. The principle already formulated in remote antiquity that nature never does anything without a reason must be accepted as applying also and, indeed, in the first place, to human nature, to the mind of man.

Those who are not prepared to accept this point of departure in science, based as it is on realistic reflection on the nature of man, will find themselves forced along a path which leads to the narrowing down and disintegration of science. Those who do, however, possess this conviction, not only accept increasing specialization, trusting optimistically that human mental endeavour will succeed in piecing together the fragments — however large in number and however varied in nature they may be — into a synthesis, but will also encourage research into component problems of all kinds, since this will give the final synthesis an ever richer content.

According to my conviction, the way to get this attitude generally accepted among scientific practitioners is to strive for the renewed practice of metaphysics, of which Aristotle said: "The science of metaphysics is not useful, it is above being useful, it is a good in itself". Metaphysics, which searches for the deepest meaning of things, material and spiritual, reveals to us the most universal laws, namely, those of *being* itself; it forms the common plane on which every worker in the sciences, the natural sciences and technics included, can take up his stand. Then there is a relationship between all thinking, greater than the diversity of the matter dealt with and the different methods employed in the various fields. Then, however far apart the different paths of specialization may have led them, men of science will meet again on the same main path. But, to quote Maritain, this metaphysics presupposes a certain purging of the will, and also that man has the strength to cling to "useless" truth. Nothing, this French philosopher continues, is, however, so essential, to man than this uselessness. What we need is not truths which serve us, but a truth which we serve.

I should like to add to this remark that nothing is more essential to us than this uselessness that hereby the practice of science which aims directly at producing practical results is also served. In metaphysics it will find a guide to lead it along sure paths and not an enemy which forces it to abandon reality and efficiency. For the practical sciences will find no handicap in it but rather an uplifting, a liberation, if they, occupying the position they do in the field of knowledge as a whole, are able to make a contribution to the benefit of mankind. By accepting metaphysics as their guide, they guarantee their own humanity.

This also ensures a fruitful relationship between science and society, which have a constant influence, the one upon the other. This influence science and society have on each other becomes ever stronger and more rapid as the pace of development increases. Their interaction was advanced considerably by society's embarking on scientific research itself, in order to profit by its results, once it had realized the material advantages which science can yield. Prior to this, science had been practised practically exclusively inside the universities. The monopoly enjoyed by the universities is now, however, a thing of the past. This fact is becoming increasingly realized and gives rise to some alarm, in my opinion partly justified and partly unjustified.

It was understandable that with the rise of technics the universities should have sought to defend themselves against the levelling-down influences that accompanied it and that they should have displayed a tendency to withdraw into their ivory towers, hardly troubling about the difficulties and the needs of society. But this meant that society began to organize scientific activity for itself. There has been an obvious change for the better in this respect too. Scientific research on behalf of society has long since ceased to be a superficial matter but poses the most difficult scientific problems, for which the co-operation of the universities and other institutions of higher education is very often called in. And, contrariwise, academic institutions know that they have to keep in proper touch with developments in society, because they so often derive from them an important impetus for their scientific work. They have thrown open the windows of their ivory towers which give on to the reality of social life. This means a gain for *both* sides, for the topicality of its work is of high importance to science itself as well. It may be that there has been a danger of social research undermining the university as a centre of scientific knowledge, and this danger may still not have receded everywhere, but on the whole, and certainly as far as the T.N.O. is concerned, it is becoming realized that the applied sciences would be losing their own matrix, if university science, science not immediately concerned with utility, were to be neglected. This will cause the equilibrium to be restored, where it has been disturbed. After what I have already said, it will not be necessary for me to try to convince you that it is my firm conviction that this co-operation will prove all the more fruitful, if science and society do not confront each other as entirely autonomous forces with entirely separate aims, but base themselves instead on the same profound laws of life and accordingly come to terms with each other in the pursuit of a common goal.

I must not go into these matters any further here, otherwise I shall be making my words of introduction too long. All I have done is to try to indicate some of the changes in structure which are taking place in our time, both in science and in society, in order to make the position and the significance of the T.N.O., as a link joining the two together, stand out all the more clearly against this general background. In the Central Organization for Applied Scientific Research, the world of science, of business and the government are working together, while the T.N.O.'s sister-organization, the Organization for Pure Scientific Research (Z.W.O.) is active in the other field of science. A number of speakers from these circles will be describing certain aspects of science as seen from their own particular angle.

In this framework we shall not be able to do full justice to all the many aspects of the T.N.O.'s work, but the organization now celebrating its silver jubilee can rest assured that unqualified admiration is felt not only for the work it is doing directly concerned with economics, but also for its other research work, such as that relating to the food and health organizations. In this field, too, the T.N.O. augments the social significance of science by its constant endeavour to shorten the process whereby its findings are put into practical effect, but, at the same time, it performs great services for science itself as well. As minister of sciences, I may perhaps be permitted to express my appreciation for this point particularly, and to offer my congratulations on this jubilee, expressing also the hope, and the expectation, that the T.N.O. will be permitted to carry on its salutary work for society and for science for many long years to come, being at the same time a source of spiritual enrichment and satisfaction to all those active in its service.

T.N.O. FROM THE OUTSIDE

We are obliged to the T.N.O. for permission to reprint below the article contributed by Dr. Alexander King, Deputy-Director of the European Productivity Agency in Paris, to the T.N.O. silver jubilee volume. (Editors)

It is a real pleasure to take part in the celebrations of the twenty-fifth anniversary of T.N.O. I well remember my first contact with the organization; it was a snow-bound day in 1947 when I visited the office in Koningskade, the Hague, and had a long talk with Professor Kruyt, interspersed with much coffee-drinking and cigar-smoking. I had known of Kruyt for many years as an academic scientist and had read many of his research papers, so the introduction was a promising one. In the course of a very short talk, the general aims and philosophy of T.N.O. came alive and ever since there has been the closest contact between it and my own organization, DSIR, which is the sister body in Great Britain.

I must confess that as an academic scientist before the war, I had never heard the magic initials T.N.O., indeed I was only vaguely aware of the existence of DSIR in Britain. This would be impossible today, because both organizations have grown not only in size and strength but have an important place in the expanding economies of the two countries. T.N.O., like the national research organizations in all the other industrialized countries, typifies our times. In the last twenty-five years there has been a tremendous increase in the amount of research done and in the rate at which new scientific discoveries are applied in industry. Research is, in fact, even more clearly recognized as the spearhead of economic growth in the modern industrial nation. At the same time as research has expanded in industry and the universities, governments, directly or indirectly, have had to create and enlarge their national laboratories.

The speed at which research is accumulating is well illustrated by figures from the National Science Foundation, U.S.A., which indicate that of the accumulated total of expenditure on research from the Declaration of Independence until the end of 1954, the mid-point was reached as late as 1948, and in fact forty-five per cent of the total research expenditure in American history has been incurred during the past five years.

The growth of national research organizations has naturally given rise to many problems. It has been appreciated in most quarters that while fundamental research is best done in the environment of a university, nevertheless a proportion of free choice fundamental investigation is useful in maintaining the health of applied research organizations. At the same time, with most national research bodies the tendency is to concentrate on pushing back the frontiers of science at places where new knowledge is required for industrial application and to carry results from the research laboratory at least some way through the development stage so that practical possibilities are more easy to assess.

I well remember being invited to take part in a discussion at Delft, I think in 1950, of T.N.O. Research Directors on the subject of applying research in industry. This meeting interested me greatly, particularly as nearly all the problems which we aired were identical with those we were then facing in DSIR. Much progress has been made since that time, both in bringing science to the under-developed firm and also in devising methods whereby interesting developments with economic possibilities are brought to the attention of industry generally. Among European national research organizations, T.N.O. has been a pioneer in facing this difficult problem of application. How far indeed should the central research organization carry its result to industry? How much interest should be taken in pilot plant development? How should new technical knowledge be brought to the attention of firms not immediately able to appreciate its significance?

The last decade of industrial development has been particularly marked by discussions of industrial productivity. The term is used perhaps too loosely. As an efficiency factor — the ratio of industrial output in terms of particular input — it has great importance, and in fact, interest in productivity measurement is one example of the growing tendency to accept a quantitative approach to contemporary problems. However, the term is used nowadays to include not only the efficiency ratio but any of the variables which control it, whether these be technological, economic, social, psychological, or educational; in other words, the term has become more and more synonymous with that of industrial development in general. It is, however, generally accepted that productivity rates do give a measure of economic well-being and although throughout most of this period concentration has been on problems of management, industrial relations, taxation and the like, nevertheless it is becoming clear that the technological factor may, after all, be dominant. It may be true to say that during a period of 10–20 years the rate of technical change is in fact the most important single condition for higher productivity, although in turn managerial, economic and other factors are significant. This means that in our forward thinking in industrial change, we shall have to pay more attention, perhaps, to problems of technological innovation, including the availability of research and development facilities, and further, to the study of social, economic and other factors which control the introduction of new techniques. In a topic such as automation, for example, one may expect that the technology will evolve spontaneously according to the needs, since the basic principles are well-known. The application of this technology may be determined, however, more by social and human problems than by the results of the research laboratory.

In DSIR we have recently decided to pay much more attention to social and economic research, not so much for its own sake but owing to its influence on the fruitful application of the results of our research laboratories. In the Netherlands, productivity matters are of course the concern of the national productivity centre, but it is good to know that T.N.O. is represented on the Council of that body and that relations between the two organizations are good.

International co-operation

In the last few years there has been a great increase in international scientific activities and T.N.O., both as an institution and through its leaders, has taken a predominant part in this. First of all, the international units helped financially by Unesco have grown in strength. Secondly, Unesco itself, after much trial and error, has established a programme of scientific co-operation which is generally accepted as practical and which has given rise also to independent organizations such as the Conseil Européen pour la Recherche Nucléaire (C.E.R.N.). It is not easy for agreement to be reached between many countries in different parts of the globe and with utterly different environments, levels of development and institutions. The national delegations to the Unesco conferences require much wisdom and forbearance therefore in order that wise decisions should be reached and compromises agreed upon which yet have some substance. Professor Kruyt, as a leader of the Netherlands delegation, has been one of the builders of this programme and has also been a dominant personality in international activities in the field of chemistry. He was also chairman for a period of the Co-operative Research Sub-committee of O.E.E.C. [1]) which, again by trial and error, has worked out a number of important collaborative research schemes, including the European low shaft blast furnace, the European Organization for Photogrammetry, and two interesting projects, one of which is in operation at Delft, for the demineralization of water by international teams and scientists. Many other particular topics of collaboration have been studied, for example, Professor Dresden was chairman of a working party at O.E.E.C. on the generation of electricity from wind power. This was an interesting exercise which, although it did not lead to any particular piece of collaborative research, has nevertheless brought together workers in this field in fruitful and continuing collaboration.

The Co-operative Research Sub-committee continues its work and the T.N.O. voice is strongly heard through Mr. Fetter, while the parent committee (Productivity and Applied Research) is frequently attended by Professor Dresden, who also occupies a special position as Scientific Adviser to the Director of the Productivity Agency. In view of the present increasing trends towards integration of the European economies, the work of these groups is likely to become increasingly important. The present shortage of scientific manpower and the increasing demand for research in all politically separated European countries augur strongly for a greater degree of collaboration and unification. There is at present no question of a single European research programme, but in my opinion economic and manpower trends both in Europe and throughout the world will demand a gradual rationalization of European research and particularly that conducted directly or indirectly by government finance. This tendency will necessitate ever closer co-operation between the national research organizations who have still much to learn from one another. Consequently, the strength and success of T.N.O. is important not only to the Netherlands but to the other Western countries.

I well remember a meeting on research organizations held in London, where representatives of all the Western European countries, Canada and U.S.A., were discussing their problems and where at one time it appeared that there was a conflict of opinion between protagonists of co-operative research as it is carried out by Research Associations in Great Britain, and those of sponsored research in the American sense. Professor Kruyt and Professor Dresden intervened forcibly in this debate and showed clearly how in the T.N.O. institutes the two systems can operate side by side and have in practice shown themselves to be compatible. This occasion has been mentioned to me many times since by people from different countries and is merely one instance of how in these last years, experience from one country is in fact considered profoundly and at times assimilated by others. The strength and success of T.N.O. has been most heartening to many of us outside the Netherlands who are interested in the growth of industrial research and in international co-operation. Personally, I have quoted T.N.O. experience in the course of discussions in many other countries and I look forward to the next twenty-five years of its evolution with confidence and expectancy.

ALEXANDER KING

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[1]) Organization for European Economic Co-operation.

HET RIJKSMUSEUM VOOR DE GESCHIEDENIS DER NATUURWETENSCHAPPEN TE LEIDEN[1]

NATIONAL MUSEUM FOR THE HISTORY OF SCIENCE AT LEYDEN

The natural scientist tends to look into the future rather than to direct his gaze on to the past. Nevertheless, it is sometimes enlightening to remind ourselves of the paths science has followed in the course of its development, of the direct and indirect causes that have had a stimulating or curbing effect on certain areas of research, and which often prove to lie in the philosophical or socio-economic field.

Historians, on the other hand, who were formerly wont to confine themselves almost exclusively to the history of politics and the humanities are becoming increasingly aware of the great influence that scientific thinking and the attainments of pure and applied science have brought to bear on the evolution of man.

Since the worker in the field of the natural sciences is usually no historian, while the historian encounters difficulty in placing certain scientific discoveries and inventions in their proper context and in determining their relative value, the practice of the history of science meets with difficulties which can only be removed by prolonged co-operation.

The contemplation of scientific instruments, preparations, illustrations and the like belonging to former ages can do much to make the theoretical and technical problems with which men of science have seen themselves confronted live for us once again. In the Netherlands the best opportunity for doing this is offered by the *Rijksmuseum voor de Geschiedenis der Natuurwetenschappen.* [2]

History of the museum

The museum was founded on the initiative of Dr. C. A. Crommelin and Prof. Dr. C. J. van der Klaauw in particular, who had a large number of instruments and other objects of considerable historical value under their charge in the physics and zoological laboratories, respectively, at the State University at Leyden. Then there was other important material as well, particularly at the Astronomical Observatory, which deserved to be preserved and to become wider known. Full justice could only be done in the long run to all this material by housing it in a museum specially founded for the purpose.

In 1928 the "Nederlands Historisch Natuurwetenschappelijk Museum" (The Netherlands Historical Natural Science Museum) was founded. It received great assistance from the government, from various institutions and from private persons both in and outside Leyden. After some years of intensive collecting and cataloguing the museum was opened to the public on June 5, 1931, occupying a few rooms in a former laboratory block.

Although the greater part of the material had come from the University of Leyden, the museum was of national character from the very beginning.

With the establishment of the museum the first aim of its founders had been achieved: the historical objects concerned had been rescued from oblivion. It soon proved, however, that far more objects of historical significance had been preserved in the Netherlands than had been supposed. New acquisitions continued to stream in, and the museum developed into a very active institution.

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[1] Communication No. 101a of the Rijksmuseum voor de Geschiedenis der Natuurwetenschappen, 1A, Steenstraat, Leyden.

[2] Other, more limited collections in this field can be found in the University Museum at Utrecht (8, Trans, Utrecht) and in the Teylers Museum at Haarlem (16, Spaarne, Haarlem).

It suffered a severe blow during the war. On December 11, 1944, a bomb destroyed part of the building containing that portion of the collections which had remained there after the most important pieces had been evacuated.

Circumstances being what they were after the war, the work of restoration took some considerable time. In the interval, the museum had expanded to such proportions that it had become impossible to continue to run it on the former basis. The government proved ready to take it over and consequently it became possible to re-open it in September 1947, as a State museum under its present name. Its future was now, we may assume, assured. The national character of the museum is emphasized by the existence of an advisory committee, composed of representatives of all the Netherlands universities.

Since then the process of expansion has continued undiminished. The library and the collection of drawings and illustrations, to mention only two departments, have been extended to many times their original size, thanks to the acquisition of a large amount of material on loan.

Collections

The museum restricts itself to pure science, reflecting only a few fundamentally important aspects of applied science. [3]) It contains departments covering physics, astronomy, mathematics, metrology, geodesy, meteorology, chemistry, pharmacy, biology and medicine. The collections consist of instruments, preparations, portraits and the like. In order that this centre for the practice of the history of science might be as many-sided and fruitful as possible, this material has been supplemented by a library, a collection of illustrations, letters and other written material, as well as cuttings, biographical notes and similar informative material.

Although the museum certainly does not want to confine itself, narrow-mindedly, to the history of science in the Netherlands alone, material relating to Dutch scientists and their work naturally predominates.

The Northern Netherlands were comparatively late in obtaining their own centres of science and learning. It was only after the resistance to the Spanish oppression that the need for universities made itself felt. The first *hogeschool* was founded in Leyden in 1575, followed by one at Franeker (1585—1811), Harderwijk (1600—1811), Groningen (1614) and Utrecht (1636). That science and learning should have begun to flourish so rapidly is undoubtedly due in part to the fact that these universities were not burdened with a conservative, medieval tradition, but, on the contrary, were fired by the modern spirit and outlook of the young commercial republic. The freedom of development existing in Holland in the field of culture, so active in philosophy and so manifest in the art of painting, proved equally fruitful in the sciences, both inside and outside the universities.

Christiaan Huygens Collection. The most important part of the 17th century period represented at the museum is the collection centering around Christiaan

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[3]) It consequently bears a closer resemblance to the Museo di Storia della Scienza at Florence and the Museum of the History of Science at Oxford than to the Science Museum in London, the Musée du Conservatoire des Arts et Métiers in Paris and the Deutsche Museum at Munich.

Huygens. [4] This scholar, excellently versed in the theory of mathematics, who, among other things, formulated the undulatory theory of light and the laws of percussion and centrifugal force, had been interested from his youth in practical work as well. Like other astronomers of his time, he ground his own lenses, since the professional lens grinders (spectacle-makers) could not deliver precision work. Some tens of lenses, some of them signed, bear witness to this activity of his. He was soon so successful with this handicraft that in 1655 he discovered the true shape and structure of Saturn's ring and this planet's largest satellite, Titan, with the aid of lenses he had made himself.

We have Christiaan Huygens to thank, too, for the invention of the pendulum clock. The construction of a good chronometer was important in the first place to astronomy. But in those days, when colonizers had switched over from coastal navigation to regular ocean crossings, it was equally vital for determining the longitude at sea, which could be a matter of life or death. The governments of the maritime nations offered large prizes for the solution to this problem. Galileo had, it is true, applied himself to studying the properties of the pendulum, but Huygens was the first to succeed in combining the free swinging pendulum to the clock, as a regulator. The museum possesses a small clock made by Salomon Coster, a clockmaker of The Hague, who worked regularly for Huygens, and dated 1657, the year in which Huygens obtained the patent for this discovery. This clock is the oldest pendulum clock to have been preserved.

The museum also has a clock with a second pendulum, which Huygens had made by Thuret in Paris, and also a heliocentric demonstration planetarium, which he had made for his own use by the clockmaker Johannes van Ceulen in 1681. In order to make his calculations for the cogwheels he was obliged to invent the continued fractions. This instrument is of great historical significance for another reason as well, for it contains the oldest balance with a spiral spring as regulator, the mechanism which was later to render possible the construction of precise chronometers. But in Christiaan Huygens' day it was still not possible to compensate the spring for changes in temperature, so that this discovery (1675) no more offered the solution to determining longitude at sea than did the discovery of the pendulum. Huygens invented various other types of regulator for time-pieces, of which recent reconstructions are to be seen in the museum. A handsome relief portrait in marble, made from the life by Jacques Clérion in Paris, completes the Christiaan Huygens Collection (fig. 1).

A large and complicated demonstration planetarium, arranged according to the system of Copernicus, and provided with a splendid, chased zodiac, is only of slightly later data, circa 1700 (fig. 5).

Physics. Experimental research was introduced into the teaching of physics as early as the second half of the 17th century. A number of air pumps provide reminders of this period. The golden age of the teaching of physics in Leyden was, however, the first half of the 18th century, when Boerhaave (1660—1738) taught practical medicine there, besides botany and chemistry for a short period. The medical section

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[4] Christiaan Huygens (1629–1695) was a son of the poet-statesman Constantijn Huygens (1598–1687). He was one of the first members of the Académie des Sciences in Paris, where he lived for many years. He worked in close co-operation with his brother Constantijn Jr. (1628–1697) on the polishing of lenses for telescopes and microscopes. Christiaan's works, notes and his extensive correspondence, published in 22 volumes (Oeuvres complètes de Christiaan Huygens; Haarlem, 1888–1951), represent a rich source of information in more than one respect for knowledge of the culture of his time.

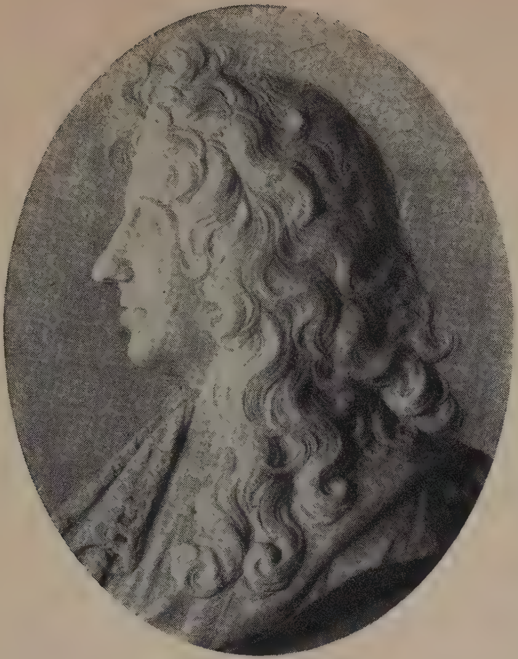
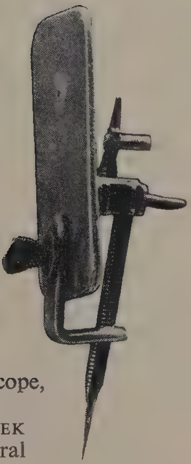


Fig. 1. Marble portrait medaillon of CHRISTIAAN HUYGENS by JACQUES CLERION, 1678.



2. Small silver microscope,
e and used by
TONI VAN LEEUWENHOEK
2–1723) at Delft. Natural

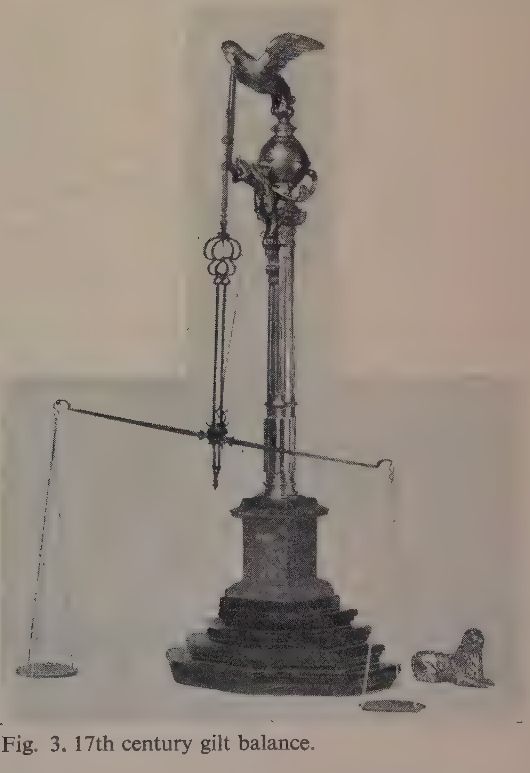


Fig. 3. 17th century gilt balance.

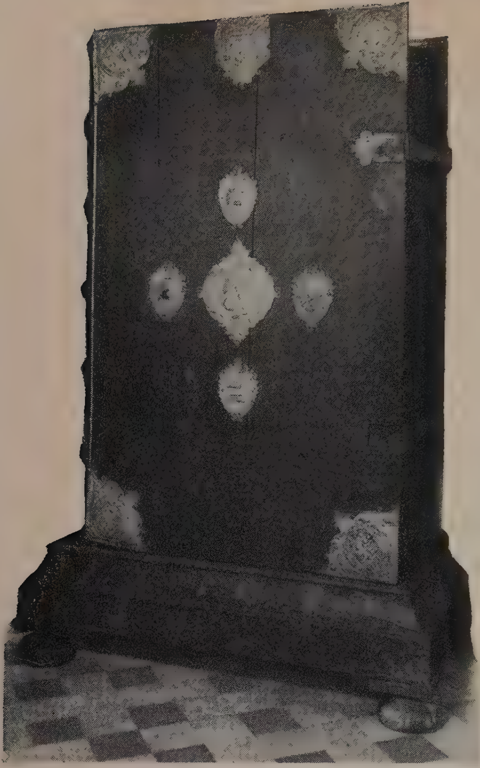


Fig. 4. Cupboard belonging to the apothecaries guild at The Hague and dated 1660. This cupboard contains the ingredients used for medicines and was used at examinations held by the guild. Height 7 ft.

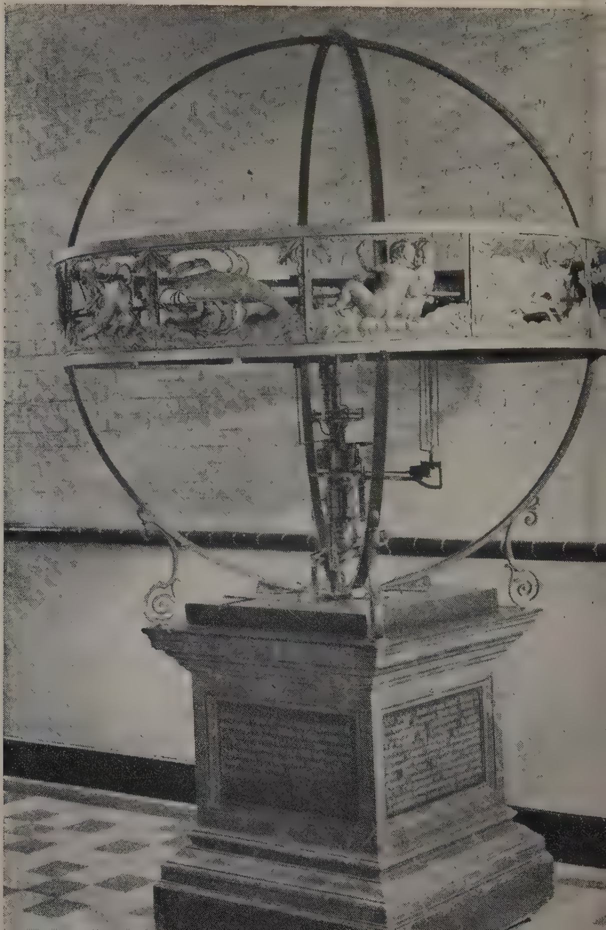


Fig. 5. Large planetarium, known as the "Leyden Sphaera" made by STEVEN TRACY at Rotterdam about the year 1700. Height: 8ft, 6 ins.

of the museum is adorned with a noble portrait of this "praeceptor totius Europae", painted in 1735 by Cornelis Troost.

At the same time 's Gravesande [5]) and Petrus van Musschenbroek [6]) were teaching experimental physics, illustrating their lectures with a series of demonstration experiments. These demonstrations were certainly not the first of their kind; 's Gravesande had probably had an opportunity of attending lectures with demonstration in Oxford and London in 1715. Practically all the early English instruments have been lost, but a large part of the apparatus used by 's Gravesande and Van Musschenbroek has been preserved and now forms the most important section of the museum's physics department. In it one can find levers and pulleys, apparatus for experiments regarding centrifugal force, percussion and pendulum laws, a splendid series of air pumps, models of steam engines, sucking and forcing pumps, dilatometers (one of Petrus van Musschenbroek's inventions), lenses, mirrors and prisms of various shapes, and the first heliostat with a time piece, invented by 's Gravesande. 's Gravesande applied to Fahrenheit [7]) for his supply of thermometers, Fahrenheit being the first to supply thermometers with scales based on two fixed, reproducible points (melting ice and body temperature). The only two remaining thermometers signed by Fahrenheit himself are held in the museum.

Petrus van Musschenbroek's fame is due in the first place to the discovery (some months after, but entirely independent of, Von Kleist) of the Leyden jar (1746). When his assistant, Cunaeus, an amateur, stumbled across this condenser, it gave him, as it gave those who tried it after him, so violent an electric shock, that they wrote to Réaumur and the Abbé Nollet about it in highly excited terms. The latter saw to it that the news about the "bouteille de Leyde" was soon creating a sensation all over Europe. Those who are hoping to find the original Leyden jar in the museum, will be disappointed. It was merely an ordinary glass, filled with water and Cunaeus most probably dropped it in alarm. The absence of this jar is, we hope, made good by the presence of a few large 18th century specimens.

Another instrument that attracts the attention in the physics department is a large plate electrical machine, with which in 1789 Professor Deiman and the Amsterdam merchant and amateur physicist, Paets van Troostwijk, decomposed water for the first time into hydrogen and oxygen.

Astronomy. 's-Gravesande and Van Musschenbroek also possessed telescopes, that of the former was made in London in 1734, under Bradley's supervision; Musschenbroek's instrument was built by one of the best-known constructors of telescopes here in Holland, a certain Jan van den Bildt (1707–1791), the nestor of a group of

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[5]) Wilhelmus Jacobus 'sGravesande (1688–1742), professor, 1717–1742, gave a detailed description of all his instruments in: Physices Elementa Mathematica. 1st. ed. 1720, 2nd. ed. 1725, 3rd. ed. 1742.

[6]) Petrus van Mussenbroek was descended from a family that has produced several excellent instrument makers.

Joost Adriaensz (1614–1693)
brass founder and gauger
Samuel (1639–1681) instrument maker —— Johan (1660–1707) instrument maker
Jan (1687–1748) instrument maker —— Petrus (1692–1761) professor

Petrus van Musschenbroek described the demonstration apparatus he used in: Introductio ad Philosophiam Naturalem, 1762. Painted portraits of Joost, Samuel, Johan and Petrus are on exhibition in the museum. Many of the air pumps and microscopes bear the trade mark of their workshop: an oriental oil lamp and the crossed keys which form part of the coat of arms of the city of Leyden.

[7]) Daniel Gabriel Fahrenheit (1636–1736), son of a merchant of Danzig, who had come to Amsterdam to acquire proficiency in the merchant's profession, turned to the natural sciences, made thermometers and barometers, among other things, and gave courses in chemistry and physics.

Frisian farmers, who successfully applied themselves to the polishing of mirrors for telescopes and of whose work the museum possesses many examples.

A number of European and Arabian brass astrolabia (15th–16th century) can also be found in the astronomical department of the museum. One of these, signed by Michel Coignet (1601), came from the celebrated Flemish school of instrument makers, as also did a large astronomical ring designed by Gemma Frisius, and made by Gualtherus Arsenius (second half 16th century).

Of the globes, one set by Willem Janszoon Blaeu (1599 and 1603 respectively) belongs to the golden age of Dutch cartography, when Hollanders were sailing out over the oceans as pioneers. Handsome ivory, silver and gilt sundials belonging to the 17th and 18th centuries remind us of the days when the pocket watch had still not become an article of everyday use.

Microscopy. The microscopy department in the museum is exceedingly well-endowed. It is not known who invented the compound microscope, consisting of at least two lenses. What is certain, however, is, that Constantijn Huygens Sr. 4) saw one in London in 1621, when visiting the Dutch inventor Cornelis Drebbel, who was in the service of the King of England at the time. Many long years were to pass before this instrument, without which whole branches of modern science would be inconceivable, came into wide use; this was not simply because the manufacture of the small, strong lenses required could only be carried out by the most experienced lens polishers, but was equally due, no doubt, to the fact that in the first half of the 17th century science felt absolutely no need for such an instrument (in contrast to the telescope which astronomy — engaged since ancient times in taking measurements — greeted with enthusiasm). Man had not got as far at the time as to take an interest in the "least esteemed creatures". It was Malpigi in Italy, Hooke and Grew in England, Swammerdam and Van Leeuwenhoek in Holland who made a beginning with the discovery of the microscopic world.

The most important discoveries and research work were not, however, done with the compound microscopes just mentioned, but with strong, simple lenses which gave a far better image, even though working with them was a tiring business. Both Swammerdam 8) and Van Leeuwenhoek 9) worked with these simple lenses. All we have of Swammerdam's microscope is the description of it by Boerhaave, but the drawings for his Biblia Naturae, collected into an album, can be admired in the museum.

Two of the famous little microscopes Van Leeuwenhoek made with his own hands are on view in the museum (fig. 2). They are no bigger than a matchbox and consist of two brass or silver plates riveted together, between which, in a tiny aperture, a polished lens, no bigger than a pin's head, is inserted. The object to be scrutinized was attached to a small needle that could be brought accurately into position in front of the lens by means of two screws. By holding this small instrument

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8) Jan Swammerdam (1637–1680), son of an Amsterdam apothecary, studied medicine and devoted himself from about 1665 onwards to microscopy, and especially to the anatomy and life history of insects. After many wanderings the manuscript of his magnum opus, the "Bijbel der Natuure" finally came into the hands of Boerhaave, who published it in 1737/38.

9) Antoni van Leeuwenhoek (1632–1723), son of a basket maker of Delft, was trained for the haberdasher's trade in Amsterdam, but soon after his return to Delft (1654) obtained posts with the government which allowed him – at least later on – plenty of time to devote to microscopy. Leeuwenhoek published accounts of his investigations solely in the form of letters, these amounting to 250 in number between the years 1673 and 1723, the majority of them being addressed to the Royal Society in London, and all of them being written in Dutch, since he knew no other language.

up against the light, the object was illuminated by transmitted light, a method of illumination which Leeuwenhoek was the first to put to wide use and which partly explains his success. He owned hundreds of these small instruments, some of which must have been capable of magnifying at least 300 times, otherwise he would not have been able to see bacteria with them. His report to the effect that he had discovered these micro-organisms (1676) was received by the gentlemen of the Royal Society with a large measure of scepticism. It was only when, more than a year later, they themselves succeeded in seeing them and when Leeuwenhoek had by this time also made known the discovery of spermatozoa (1677), that his name was on everyone's lips. Whereas previously mites had been regarded as living atoms ("prae exiguitate indivisibiles"), they now proved to have legs, eyes, hairs and intestines, while properly-functioning small animals also existed a thousand times smaller. It was thought with true 17th century optimism that with the discovery of spermatozoa we were well on the track of biological reproduction. It was necessary to revise our notions of "large" and "small", of "despicable" and "admirable".

Microscopy disappointed these high expectations, however; it demanded from the scientific experts great adroitness and endless patience. Scientists chose to return to the old paths, one of the reasons being because microscopy had been brought into discredit by the numerous amateurs who had pounced upon the spectacle of "life in a drop of water". Countless amateurs' microscopes dating from the 18th century are to be found in the museum. Small, simple hand-microscopes, handsomely decorated compound drawing-room instruments and solar microscopes, accompanied by slides bought ready made, most of them coming from the Netherlands and England, tell their own story.

The Van Musschenbroek family [6]) has made its contribution in this field as well. Several of its microscopes, part of them equipped with polished lenses and part with small spheres of glass, can be seen in the museum. But many specimens can also be found in foreign collections, having been taken abroad by the cosmopolitan group of students who attended Boerhaave's and 's Gravesande's lectures.

Towards the end of the 18th century a growing need made itself felt in biology for better microscopes, not so much for those that gave a larger, but rather for those that gave a sharper, image. The objective lenses in telescopes had already been replaced by achromatic systems about the year 1760, but this improvement led in the beginning to insuperable difficulties with the much smaller lenses used in microscopes. In 1807, however, Harmanus van Deijl (Amsterdam) succeeded in using such lenses. In 1824 a new way was opened up in France and from then on microscopy entered upon an entirely new period. The results were plucked rapidly like so much ripe fruit, though not without effort: the general cell-theory (circa 1840), cellular pathology (Virchov, circa 1855), bacteriology (circa 1875) and also — two centuries after Leeuwenhoek's description of spermatozoa — the fusion of the ovum with spermatozoa meant that biology and medicine had entered upon a new phase.

The story of the development outlined here can be followed in the museum, where numerous microscopes coming from the Netherlands, England, France, Germany and Italy are on display. One notices how the quality of the German instruments lags behind that of the English and French, until Carl Zeiss, aided by Ernst Abbe, founded his optical industry on a wholly scientific basis (circa 1870), he being the first to do this. It is remarkable that, though the most highly perfected microscopes continued to be made in England during the 19th century as well, the amateur

mentality continued to prevail there in microscopy, while on the continent microscopic anatomy, histology, cytology and microbiology developed rapidly with the aid of simply constructed microscopes, the forerunners of our modern stands.
Microscopy has brought us prematurely to the 19th century. The chemistry, biology and pharmacy departments provide a less coherent picture, owing the lack of sufficient material; they, too, however, contain important reminders of the past.

Biology. A very early herbarium belonging to the German traveller Leonhard Rauwolf (1560) lies side by side with a recent specimen, containing all the variations of *Oenothera*, compiled for the museum by the founder of the mutation theory, Hugo de Vries (1848–1935), A lifesize portrait of Linnaeus in Lap dress, painted during his stay in Holland (1737), leads us back once again to the glorious days of Boerhaave and 's Gravesande. In those years there worked in The Hague a certain Pieter Lyonet, whose "Traité de la Chenille qui ronge le bois de saule" (1760), illustrated by himself with a set of magnificent copper-plate engravings, has yet to be excelled two centuries later. The memory of him is kept alive by a well-executed portrait and by his microscope (the oldest dissection microscope in existence), together with some drawings and engravings.
Also to be found in the biology department are a number of drawings by the astistically gifted anatomist Petrus Camper (1722–1789), concerning, among other things, the facial angle, the first successful attempt at anthropometry. A display cupboard with anatomical preparations, many of them with coloured vascular injections and rendered transparent by use of turpentine, carries our thoughts back to the days of Ruysch, Albinus and others (1st half of the 18th century) whose art of preparing has hardly been equalled. The material on exhibition shows that comparative anatomy made great strides in the 19th century, being concerned to begin with exclusively with the vertebrates, but later on with the invertebrates as well.
A handsome series of herbals shows the transition from medieval to modern botany. These books, often considerable tomes, inspired the Hague guild of apothecaries, in 1660, to give the chest in which it kept its possessions and collection of samples of raw materials for medicines the shape of a book bearing the inscription: Thesaurus Sanitatis (fig. 4). A number of handsome mortars, including a large bronze specimen made by the famous bell-founder François Hemony (1661) date from the same period.

Medicine. The medicine department — housed, unfortunately, in very narrow quarters — has mainly surgical instruments on display, e.g. those for amputations, cauterization, trepanning, lithotomy and the extraction of bullets, instruments which make us realize how sorely our forefathers suffered under the hands of doctors in days when there was no such thing as narcosis and when blood poisoning and infection were the order of the day. The pincers, "pelicans" and keys used for the extraction of teeth form a similarly depressing subject, while the history of the evolution of spectacles shows us that the frames were the main point of concern and the lenses a matter of secondary importance, until the shape of the lenses began be based, in the middle of the 19th century, on optical science, thanks largely to the work of the Dutch ophthalmologist F. C. Donders.
The past century. For the rest, the 19th century produced few really great achievements in the Netherlands in the field of the natural sciences, until, towards the end

of the century, a new rich period of florescence dawned. The museum possesses portraits and other mementos of many of the scientists of this period. In the field of chemistry J. M. van Bemmelen (1830–1911) won fame for himself as one of the founders of colloidal chemistry. The museum possesses ten small paper models made with his own hands by J. H. van 't Hoff, who put forward the theory of the spatial arrangement of the atoms in molecules at the same time as Le Bel (1874); he had used these models to explain his theory of the asymmetrical carbon atom to a friend of his.

The science of physics is represented among other things by the electromagnet with which, in 1896, P. Zeeman discovered the effect named after him (influence of the magnetic field on the frequency of light-waves), a phenomenon which Lorentz had already predicted on the basis of his electron theory. The apparatus from the cryogenic laboratory of H. Kamerlingh Onnes, with which this physicist produced liquid helium for the first time, in 1908, has been erected in the museum, together with units used for research at low temperatures, such as those concerned with the supraconducting state of metals (discovered in 1911), the magnetic moment of molecules (Einstein–De Haas effect, 1915) and the diminution of temperature due to demagnetization (Keesom, by means of a large electromagnet, 1926 solid helium; De Haas and Wiersma with the aid of paramagnetic salts, 1935). From the evidence of a letter of application from Einstein in 1901 it appears that he, too, soon realized that it was a privilege to be allowed to work in this famous laboratory. He apparently received a negative answer to the application concerned. But who could forecast that the scientific star of this 21-year-old student, aspiring to the post of an assistant, was to rise later on to so high a place in the firmament? A series of letters bears witness to his later friendship with Lorentz.

Einthoven's string galvanometer (1903), designed and tested with endless precision and equipped with a heavy electromagnet, heralded a new phase in the diagnosis of heart diseases. This original instrument rests in the museum together with still more sensitive galvanometers (with an extremely fine string in vacuo), with which he first registered radio signals from Indonesia by photography (1923).

Eykman, a Dutch Nobel prize winner, like many of the scientists already named (Van 't Hoff, Lorentz, Zeeman, Kamerlingh Onnes and Einthoven) is also represented in the museum. With his co-worker Grijns he shares the honour of having realized, at a time when we were inclined to ascribe all illnesses to bacterial infection, that beri-beri was a deficiency disease, thereby making a beginning with the theory of deficiency diseases.

Much still remains to be done for the museum. It is, for instance, impossible in many cases to supplement the authentic pieces with other material so that they form a consecutive story, owing to lack of sufficient space. Nevertheless, for everyone who wants to come and see and listen, the museum brings to life a period of several centuries of richly varied scientific endeavour.

MARIA ROOSEBOOM

COMMEMORATION OF TWO GREAT FOREIGN SCHOLARS

J. A. COMENIUS (1592-1670)

The great Czech scholar and pacifist, Comenius, who published his great work Opera Didactica Omnia in Amsterdam three hundred years ago, was commemorated once again this year at a number of places in Europe. Quite recently an excellent statue of him by his compatriot, V. Makovski, was unveiled at Naarden in the Netherlands, where twenty years ago a mausoleum built above his grave was dedicated. A year ago another statue was erected to him in his birthplace, Uhersky Brod, in Czechoslovakia, while he was also commemorated in May last in the Polish town of Leszno, where he passed a considerable period of exile, prior to his days in Holland.

In connection with these commemorations we have received the following contribution from Dr. R. A. B. Oosterhuis, a prominent authority on Comenius in the Netherlands.

(Editors)

Jan Amos Komensky, as he is known to the Czechs, the greatest paedagogue his country has produced and a figure of lasting significance on that score alone — yet ranking even higher as a true patriot and religious leader — lived in an age of great turmoil. The external events of his life reflect the political and spiritual unrest which prevailed in the Europe of his time. The figure of Comenius rises up out of that turmoil like a monument around which the fervent longings and aspirations of his compatriots were concentrated.

When, in 1628, he arrived as an exile in the Polish town of Leszno, that had become the place of pilgrimage of the fugitives of the Unity of the Bohemian Brethren, he had already been long of the conviction that the science he practised should no longer be restricted to serving local needs alone. His vision had widened and he already saw the prospect of a United States of Europe for which he wrote his best-known works; the *Janua Linguarum Reserata* (Gate of Tongues Unlocked and Opened) and the *Didactica Magna* (Great Didactic). Both these works are peak achievemens in a whole series of didactic works, which with financial assistance from the Amsterdam merchant, Laurens de Geer, were issued in one volume, the *Opera Didactica Omnia* (Complete Didactic Works) in 1657.

It is not so widely known that after the surrender of its independence in 1648, Comenius remained till his death his country's last unofficial advocate. He kept this activity as secret as he could in order not to incur the displeasure of the regents of Amsterdam. He was also the last bishop of the Unity of the Bohemian Brethren and in this capacity was a highly active organizer.

In later ages these exceptional qualities have stamped Comenius as one of the greatest figures in Czech and Moravian history, a man who succeeded in lighting upon exactly the right word for men like himself in the tragic situation in which his country and people were caught in his day — *Viri Desiderii,* men of longing, longing for unity and peace. Since he was a great man of literature, who composed many fine verses, his consolatory letters, which were passed from hand to hand among his suffering compatriots, made a deep impression.

His sojourn in England (1640/41) provided the impulse for him to write his *Via Lucis* (Way of Light) in which he addresses himself openly for the first time to the forum of Europe and in which he also gives expression to his ideas on peace in the fields of politics and religion. He was able to dispose of the objections which the Brethren raised to his views, and from then on he regarded it as his chief task in life to announce his *Pansophia,* i.e. the system which would bring universal peace, which would improve the general situation everywhere and which would unite all the different churches into a single world-wide church.

In order to achieve this aim he was not averse to changing his more peaceful abode in Poland for that in Saros Potok, in Hungary, to become the head of the pansophical high school in that country from 1651 to 1654. In 1656 he was forced to leave Leszno after the town had gone up in flames during the Polo-Swedish War. Where was he now to turn?

An invitation received from his Maecenas, Laurens de Geer, proved most opportune. He proceeds to the Netherlands for the fourth time in his life and is destined to spend the last fourteen years of a life full of vicissitudes in comparative peace in Amsterdam, where he died in 1670.

In an interesting study, Professor Polisensky at Prague has shown what geat contacts existed between the United Provinces of the Netherlands, in their struggle for freedom against Spain and Bohemia, that was at the time locked in a struggle with the Austrian Hapsburg dynasty. Comenius, who had acute insight into international trends and who could predict the future so well that he forecast the partition of Poland, which did not take place until more than a hundred years after his death, was full of admiration for the government of the Netherlands Republic. He regarded it as a singular blessing that feudalism had been abolished in this country at a time when Bohemia still groaned under it. Indeed, he regarded feudalism as one of the causes of his country's downfall. There is no doubt that the Netherlands became very dear to Comenius. He called Amsterdam, of which he was made a freeman, the finest of all cities, and he was befriended with several members of the city council. The wars with Protestant England were, of course, a thorn in his side. In the year 1667 he addressed himself to the negotiators of peace at Breda with cogent arguments in favour of an early peace, in what is one of the most beautiful pieces of writing to come from his pen, his *Angelus Pacis* (Angel of Peace). In this remarkable work he praises the people of the Netherlands, who led a hard life, while their country itself lacked the beauty and natural resources of neighbouring lands. It was a good thing, therefore, that the Netherlands should have settlements in territories overseas.

Shortly before 1940 important unpublished works by Comenius, belonging to his Amsterdam period, were discovered in the orphanage at Halle. They are the *Panglottia,* which deals with a projected world language, the *Panpaedia,* which covers general education, and the *Panorthosia,* which announced the general plan. These works will form the object of study at the great Comenius Congress to be held in Prague in September of this year.

After the first world war, Masaryk, the president of Czechoslovakia, never caesed to point to the principles of Comenius and to cite his words; under the Communist régime, no mention was made of his name for some years, until, with the publication of an important Russian study, he has won the hearts of even the Czech Communists. So far the question whether Comenius himself, whose motto was *absit violentia rebus* (violence is foreign to the nature of things), would have approved of political Communism has been left out of discussion in the Slav press.

R. A. B. Oosterhuis

C. LINNAEUS (1707-1778)

The role played by the Netherlands in the life of Carolus Linnaeus (1707–1778), known, after being raised to the nobility in 1761, as von Linné, was far-reaching in its effect. He came to this country in May, 1735 as a young and unknown medical man, to take a degree at Harderwyk and to "meet well-known natural scientists", and departed again for his native country, Sweden, in 1738, as the author, admired by all nature-lovers, of 1,350 pages of octavo and over 500 pages of folio. 1)

Linnaeus is a remarkable figure, on the one hand uncomplicated, spontaneous and making straight for his goal, and, on the other, gifted with a deeply penetrating and comprehending love of nature, which enabled him to bring order and clarity into the abundant variety of its phenomena. He felt himself charged with a task: "Deus creavit, Linnaeus disposuit". This task was to produce a *Systema naturae* which would reduce the chaos of nature to an orderly system. Everything has to give way before it; he saw his whole life organized about it – "God has made him the gift of the largest herbarium in the world", in order that he might fulfil this mission.

It was the custom at the time in Sweden to take one's degree abroad. Like many of his compatriots, Linnaeus chose Harderwyk in the Netherlands for the purpose. The notes he made in his pocket almanac and numerous autobiographical notes compiled at a later date provide us with a wealth of information about his life in the Netherlands. 2)

He already has his dissertation on intermittent fevers with him in his luggage — together with a number of other manuscripts — when he arrived in Amsterdam via Hamburg on June 13, 1735, After a fleeting visit to the director of the *Hortus* in Amsterdam, Professor Joh. Burman, and to Albert Seba, the "German apothecary" with the world-famous natural history cabinet, he made, again by ship, for Harderwyk. After a thorough inquiry into his knowledge of medicine, Johannes de Gorter, professor of medicine, helped him to obtain his doctor's degree in a very short space of time. He arrived in Harderwyk on June 17 and obtained his degree on June 23, after defending a number of the Aphorisms of Hippocrates and a *Hypothesis nova de febrium intermittentium causa.* The next evening the skipper of the trading vessel took the young doctor of medicine back to Amsterdam.

Visits to Leyden and Utrecht followed. It was the Leyden *medicus botanicus*, Johan Frederik Gronovius, who first saw the importance of the manuscripts Linnaeus

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1) *Systema Naturae, Bibliotheca Bothanica, Fundamenta Botanica, Musa Cliffortiana, Critica Botanica, Flora lapponica, Genera plantarum, Corollarium gen. pl., Methodus sexualis, Hortus Cliffortanius, Viridarium Cliffortianum, Classes plantarum,* while he also published the *Ichthyologia* by his friend Artedi who met a sad end, by drowning, in this country.

2) A. Afzelius, Egenhändige Ant. af Carolus Linnaeus om sig sjelf, 1832; F. Bryk, Linnaeus im Auslande, 1919; the biography by T. M. Fries and its English translation by B. Daydon Jackson, 1923; de Bref och Skrifvelser af och till Carl von Linné; de Arrskriften van de Sv. Linné-Sällskap, de almanac mentioned being described in volume 18, 1935. Cf. Engel in Vakblad voor Biologen, 30,2 pp. 29–32, Feb. 1950.

showed him. He offered to pay for the printing of the *Systema Naturae* (first edition in folio). It is impossible to overestimate the value of the further scientific and financial assistance he received from Gronovius with the publications of all the works listed in footnote 1. He introduced Linnaeus, with some difficulty, to Boerhaave and the latter saw to it that George Clifford, the Amsterdam banker, took him on as his private doctor, as master of his wonderfully rich *Hortus* and, we might even say, as his foster-son. For three years Linnaeus lived like a prince in this botanical paradise,[3]) had an opportunity of working with Burman on the *Flora Zeylanica* and, with Gronovius' help, of getting his other works printed, while forming a wide circle of friends at Leyden.[4]) He turned down proposals for a journey to Dutch Guiana (Surinam) and the subsequent offer of a professional chair at Utrecht. He never learnt to speak Dutch. It is no wonder, therefore, that after three years he was longing to return to his home country and to his betrothed, and at last he tore himself free and returned to Sweden in May 1738, via Brabant and Paris.

It was only natural, therefore, that the 250th anniversary of Linnaeus' birth should have been commemorated in various ways in the Netherlands as well. At the Zoological Museum in Amsterdam an exhibition was organized with the use of exhibits obtained from the Linnaeus Collection in the Artis (Zoological Gardens) Library, Amsterdam. The exhibition was opened by Mr. O. Kaijser, acting as the Swedish Ambassador's deputy. The next morning Mr. Kaijser performed the same ceremony in connection with the exhibition of Linnaeus' works (many of them from Dr. D. MacGillavry's collection) held in the University Library at Leyden. During the lecture in the Amsterdam *Hortus* by Mr. and Mrs. de Graaf on their journey to Lapland, where they had followed in Linnaeus' footsteps, Prof. Heimans also gave a brief account of his botanical works.

But the climax of the celebrations came in the afternoon of May 23, with a pilgrimage to the Hartekamp, the country house of Clifford, the banker, where Linnaeus had lived for three years (here hospitality was offered by the Poenitenten Fathers, who run a Boy's Home there) and to what was formerley its "overtuin" – the garden across the road, now a botanical paradise once more and known as Linnaeus Court (Linnaeushof). Here the burgomaster of Haarlem, Mr. Cremers, and the Chairman of the Committee, Professor H. T. Lam, laid a wreath against the bust of Linnaeus, standing in this garden. Prior to this, the entire company of 260 Linnaeus admirers had been received in worthy fashion in the former Knights' Hall of the Counts of Holland, nowadays the town hall of Haarlem. Here Professor Lam, the director of the National Herbarium at Leyden, had bidden the guests welcome and given an account of Linnaeus' services to botany, after which Professor H. Engel had drawn a picture for his listeners of Linnaeus, the man, calling attention to the significance of the rôle the Netherlands had played in his life. Professor G. A. Lindeboom of the Free (Reformed) University of Amsterdam, then spoke of Linnaeus' often forgotten services to medicine.

On the morning of May 24 many Linnaeus admirers gathered together in the fine old Council Hall at Harderwyk. Burgomaster G. J. Numan told of the former Academy

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[3]) *Hortus Cliffortianus.*

[4]) Van Swieten, Lawson, Lieberkühn, Kramer and Bartsch belong to this circle, besides Gronovius. It is known how, in the family circle, he would tell of his difficult and hazardous journey of exploration to Lapland, liking to put on his Lap costume, of fur with a red lining, for the occasion. M. Hoffman made three portraits of him in this attire, all of which have been preserved. One is in the History of Science Museum and one in the Natural History Museum at Leyden, the third being in Stockholm.

(abolished by Napoleon on Cuvier's advice), while Mr. F. W. Drijver, curator of the Veluwe Museum, spoke about Linnaeus himself. Afterwards a visit was paid to the old *Hortus*, to the Hall of Anatomy, the Academy Tower (where the burgomaster attached a wreath to a bust of Linnaeus), the church, which was formerly used as a lecture hall, and to the Veluwe Museum, with its many reminders of the former Academy.

Thus during 1957 the various places associated with Linnaeus' days in this country were visited by scholars and by admirers. Articles about him appeared in many newspapers and professional journals. The Swedish Ambassador presented a copy of a biography by the great Linnaeus authority, Dr. A. Hj. Uggla (translated by Dr. Boerman) and provided highly welcome and practical illustrations for use in the exhibitions.

H. ENGEL 1)

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1) Professor Dr. H. Engel is the director of the Zoological Museum in Amsterdam.

CHRONICLE

INSTITUTES

A T.N.O. institute, national and international[1])

The Plastics Research Institute T.N.O. at Delft

NATIONAL

The Plastics Research Institute T.N.O. at Delft began its work in 1946 with a staff consisting of one director and one secretary; nowadays it employs more than two hundred people, including some thirty university men.

The foremost aspects of the Institute's activity are as follows:

1. *the scientific aspect:* knowledge of macromolecular substances and their characteristics;
2. *the technological aspect:* the process devised;
3. *the economic aspect:* the supply and demand of raw materials, auxiliary materials, and the economic significance of research work and industrial projects.

The Institute's scientific work, in the performance of which it maintains close day-to-day co-operation with the Central Laboratory of the Industrial Organization T.N.O. and with other T.N.O. organizations, as the need arises, provides the spiritual foundation for all the Institute does. Lacking this scientific basis, the Institute would lose its essential significance, while it could exercise no authority in practice. The quality of its scientific work ensures that it obtains the ready assistance of all those whose co-operation is necessary or desirable in one connection or another.

The Institute's technological and economic work forges links in various ways with the business world and it is this that provides it with its *practical* raison d'être. Both its technological and its economic activity have resulted in industry adopting a less reserved and more appreciative and positive attitude towards the Institute, and one may, in fact, say that the Netherlands plastics industry has developed for a large part hand in hand with the Plastics Research Institute T.N.O. Moreover, the contact between the Institute and industry is becoming increasingly closer, as is witnessed by the growing number of commissions received from industrial concerns, whereby the Institute is placed in an even better position to lend its support to developments advantageous to the Netherlands economy.

INTERNATIONAL

In our time world events are not in the habit of passing by unnoticed. It is the most natural thing in the world to be presented every day at the breakfest table with a detailed report of what has just happened – even in the remotest parts of the world. We can no longer think of sport without international matches and contests or of cultural manifestations without international exchange. And contacts with his colleagues in other countries, besides his own, are probably more necessary to the research worker than they are to other representatives of modern society.

Both the scientist and the technical expert are fully conscious of the fact that each is not working in isolation, but that he and his work form a cog in a greater whole of unlimited size. Within this apparatus he will only be able to perform his task to full advantage, if he is aware of what is being done in his field elsewhere in the world. If he is aware of this, he will be in a position to make as useful a contribution as possible to society.

Another, quite different, advantage is that foreign contacts very often result in research commissions. And an institute that has many foreign commissions in its in-trays is able to expand its facilities in the way of more equipment and a larger staff, whereby Netherlands industry is again benefited in the long run. The directors of the T.N.O. are very well aware of the importance of this and will not only give contact at the international level their approval but, in many instances, will actively encourage it. However, the superabundance of opportunities for international contact which the past few years have offered has made it necessary for them to impose some restrictions, otherwise half their staff would be perpetually abroad. They would also like to see some co-ordination in the organization of gatherings of experts. For the rest, it is becoming more and more the custom to draw up plans for journeys abroad at the beginning of the year so as to ensure better distribution. The contacts a T.N.O. worker has with his colleagues abroad can be passive or active in nature.

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[1]) See the introductory article on the T.N.O. on page 3 of this issue. The present contribution has been provided by Ir. F. W. R. Wijbrans, deputy director of the Plastics Research Institute T.N.O. at Delft.

Passive contacts may, for instance, take the form of perusing articles published in foreign journals and related to work being done in this country. Listening to addresses delivered at symposia and congresses can also be included under passive contact. The importance of this sort of contact cannot be denied, especially as far as the younger research worker is concerned; but it is as well not to leave it at this. Active contacts are those in which the research worker goes out himself to visit his colleagues in associated laboratories or to make his contribution to some conference they may be attending. This is highly important, because, as in the case of the preparation of a work for publication, it is necessary for the man concerned to make a thorough study of his subject. Remarks or criticisms made by his colleagues from abroad can provide important indications for his further work. Another positive side to these active contacts is the publicity the institute and its activity thereby acquire. One cannot entirely do without publicity in research work either. It is remarkable, moreover, how often good friendships can result from contacts with colleagues abroad, thereby enabling one to make one's own modest contribution – in an atmosphere of mutual understanding and sympathy – to better relations among the peoples of the world.

In order to illustrate the foregoing remarks with a few concrete examples, particulars follow of the existing contacts of the Plastics Research Institute T.N.O.

The International Union of Pure and Applied Chemistry (IUPAC) forms the medium for periodic meetings of chemists. The gatherings this organization holds are planned on a broad basis so that everyone attending them can find something in his line to interest him. Moreover, it organizes specialist symposia, of which the "Macro-molecular Symposia" are of great significance to the Plastics Institute.

The International Standardization Organization (ISO) is a highly useful and purposeful organization concerned with normalization and standardization at the international level. The meetings of this group are designed to achieve results by joint endeavour; for those concerned with the testing of materials these meetings provide an opportunity for making interesting contacts.

The "Fédération International de Documentation" (FID) forms the meeting place for those engaged on the work of documentation. This Federation is responsible for the Universal Decimal Classification and deserves the interest of every research worker for that reason alone.

Exhibitions and Congresses, such as the German "Kunststofftagung", the British Plastics Convention, the Hanover Trade Fair, are regularly visited, provided they are not held in places too remote from the Netherlands. It would not be possible for the Institute to perform its work of providing information properly, if it did not keep itself continually informed about new lines being put on the market. On a number of occasions the Plastics Institute has acted as an intermediary in providing *collective entries* for international exhibitions. If, finally, mention is also made of visits to foreigners supplying the Institute with commissions, visits which are absolutely necessary to serve their interests, it will come as no surprise to learn that travelling expenses form a relatively high percentage of the Institute's total expenditure.

There was more to it than a joke, when the Minister of Education, Arts and Sciences remarked, on announcing a royal award to one of the T.N.O.'s prominent personalities: "The gentlemen concerned is making an official trip abroad at the moment, as befits a good T.N.O. man".

INTERNATIONAL COURSES

(for basic data on each course, see last pages of this Bulletin)

Highlights of the 1956-1957 session of the Institute of Social Studies, The Hague

On July 3, 1957, the "Annual Day" marked the end of a successful 1956–1957 session at the Institute of Social Studies at the Hague. On this day, the Rector, Prof. E. de Vries, handed out the diplomas to those students who had successfully completed their programme of study. Students of the Institute's Two-Year Course in the Social Sciences, 1955–1957, received their postgraduate degree of Master of Social Sciences, the participants of the Six-Month Advanced Course in Public Administration, 1957, received the Diploma in Public Administration and the participants of the Six-Month Advanced Course in Economic Planning and National Accounting received the Diploma in Economic Planning and National Accounting.

The outgoing students returned to their home countries to resume their former positions, or to take up new posts in their university or government office, after having followed training programmes, which, though differing in content, had all been focussed on the problems of rapid economic development and social change. Their study programmes had consisted of general and specialized lectures and seminars in the field of economics, sociology and public administration, in practical field work and excursions and in the preparation of an individual research paper or thesis. The teaching staff was drawn from the Institute's permanent staff, from the Netherlands Universities and from experts in government and private circles, notable contributions being made by no less than 23 guest professors from abroad, such as Prof. Ragnar Frisch, economist from Oslo, Prof. M. Ginsberg, sociologist at the London School of Economics, Prof. H. R. C. Greaves, Professor in Public Administration from the same school, and Dr. Lanfranco Ricci from Rome, who took a leading part in one of the Institute's seminars on rapid social change (subjects: Ethiopia and Japan).

Two general programmes brought the students of the various courses who had been studying problems of development in classroom and library, into closer contact with the practical problems. During the month of April a special seminar was held on Problems and Methods of Increasing Productivity, in which experts from the Netherlands and from the European Productivity Agency in Paris made students better acquainted with productivity and its various aspects. During the Seminar a four-day working visit on productivity in agriculture and industry was made through the Netherlands (Komgronden area, Northeast Polder, the province of Drenthe and the IJ-mond region). In June, forty-two students made a five-day working trip through four countries of the European Coal and Steel Community; Netherlands, Germany, Belgium and Luxemburg. It is not surprising to find the highest number of participants of the Institute coming from countries which are presently passing through a period of rapid development. During the 1956–1957 session, attendance per country (students and associate students) at the Institute was as follows: India 20, Egypt 9, U.S.A. 5, Jordan 3, Netherlands 3, Greece 2, Burma 2, Korea 2, Pakistan 2, Irak 2, and one each from Haiti, Yugoslavia, England, Surinam, Iran, Panama, Finland, Thailand, Indonesia, Ceylon, Brazil, Malaya, Spain. Thirty-one of these students were awarded a scholarship through the intermediary of the Institute. The other thirty-five students came at their own expense, or were supported by fellowships from the United Nations, governments and other bodies. Compared to the previous academic year (2 courses, 30 students) the Institute doubled its activity in 1956–1957 (4 courses, 66 students) and it was quite a problem to accommodate all courses and participants in the present building (the former Royal Palace). Fortunately, it was possible to open a new Library and Reading Room on January 4, 1957, so that the old Library could be converted into a lecture hall for the Economic Planning Course. Other highlights in the past academic session were (in chronological order): the Annual International Charity Ball on February 9, 1957, of which the proceeds were donated to the UNICEF; the visit of Her Majesty Queen Juliana on April 13, and the visit of Members of Parliament on May 29.

This year the Institute is celebrating its fifth anniversary. It had been predicted that the first five years might well be regarded as a „running in" period, to use a term borrowed from the garage. This prediction has come true. With its programmes now clearly rounded off, its name established, and its alumni returning from The Hague to countries all over the world, the Institute looks forward confidently to its sixth year.[1])

Co-operation between the Training Courses and Research Foundation and NUFFIC

For some years now the Training Courses and Research Foundation has been providing an annual international course on Small-Scale Industries at Delft. This course has acquired a favourable reputation abroad and with such international bodies as the U.N. and the I.L.O. The organization of small-scale industries is of high importance to most countries undergoing accelerated economic development and the number of them interested in these training facilities is very considerable.

Arrangements have now been made for co-operation between the Foundation and NUFFIC, which will take effect with the Autumn 1958 Course. The form this co-operation will take can be compared with that existing between NUFFIC and the Technological University at Delft with regard to the International Course in Hydraulic Engineering (see the final section of this Bulletin). The foundation will be responsible for the instruction, both practical and theoretical, while NUFFIC will make the course known abroad and will take charge of recruitment and the necessary administrative and social arrangements on behalf of the students attending the course.

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[1]) This article has been supplied by the Institute of Social Studies. For all further information, please apply to the Rector, Institute of Social Studies, 27 Molenstraat, The Hague.

INTERNATIONAL SCIENTIFIC MEETINGS

The International Symposium on Isotope Separation

Organized in Amsterdam, April 23–7, 1957, by the Netherlands Society of Physics, in collaboration with the International Union of Pure and Applied Physics. Chairman Prof. Dr. J. A. A. Ketelaar, Secretary Prof. Dr. J. Kistemaker.

This Symposium was the first meeting of its kind and importance, at which specialists contributed on nearly all themes of isotope separation.

Though the meeting was organized essentially to discuss the separation of stable isotopes, a substantial part of the lectures, discussions and individual reports was induced by the presence of research groups and individual scientists who have been working in the field of ^{235}U separation since 1940 or in the past few years. The obviously still very interesting question of nuclear fuel enrichment, linked with the possible production of highly enriched material attracted a good deal of attention at this meeting.

The process of gaseous diffusion, which makes possible the production of enriched ^{235}U on an industrial scale, has been worked out to a high degree of technical perfection and any country could achieve the same work by following the example set by these factories. Nevertheless, it appeared to be impossible to obtain more information than that comprised in a few interesting reports on membrane performance and cascade connections, given by British and Franco-Italian teams. Specialized questions, such as those put, for instance, on membrane material, could not be answered, due to the high degree of classification of the subject.

The lectures of Abelson and Cohen on Liquid Thermal Diffusion of UF^6 formed a fairly complete discussion of this subject. The method has been applied in Oak Ridge for the preparation of feebly enhanced material for ion source leadings of the "calutrons" but has not proved to be promising for securing a higher degree of enrichment or large-scale production.

A competing method for gaseous diffusion, the "Trennduese", was described in an excellent lecture by its inventor E. W. Becker, but at the moment it is very unlikely that his procedure will be considered, notwithstanding its attractions.

We are pleased to be able to mention that in the Netherlands, at the F.O.M. Laboratory for Mass Spectrography in Amsterdam, research is going on, under contract, for the R.C.N. Foundation, and in co-operation with the Groth group in Germany, on the ^{235}U concentration for peaceful application by means of the method of ultracentrifugation, which is considered to have some advantages over gaseous diffusion. News of this was given by Los and Kistemaker.

Distillation and chemical exchange methods have long since passed from the field of laboratory equipment to that of chemical engineers. In Israel, enriched ^{18}O is available in the form of water and Clusius pointed out that the preparation of highly enriched ^{17}O should now be possible. In the U.S.A., production of 99.9% ^{15}N has been started on the basis of the Taylor and Spindel process.

Research on Boron isotope separation resulted in a solution of the problem of the most economical method. Distillation of Borontrifluoride proved to be superior to the combined distillation chemical exchange of trifluoride addition compounds.

Many possibilities and questions remain in the field of the Tithium isotopes. The Klemm group, which specializes in electromigration in molten salts and metals, gave lectures on experiments and theory. 99.974% ^{7}Li has been prepared. The ion exchange method is still dominated by the question of the magnitude of the elementary effect, and the discussion was given a new impulse by remarks made by the Kramers group of Delft, where a factor of 1,02 has been measured.

In the thermal diffusion section, Clusius pointed out that Bromine isotopes now can be separated by this method. Two Dutch reports dealt with a new development in age determination by A. E. de Vries, and diffusion in a flow system by D. Heymann, both from the Laboratory for Mass Spectrography (F.O.M.).

The specialists on electromagnetic separation had a separate session and demonstrated the steady development made since the Harwell Conference by reports on the E. M. Separators for the Transuranium Elements. Mr. Rol of the Laboratory for Mass Spectrography (F.O.M.) gave a lecture on the sputtering phenomena of metals, bombarded with fast ions.

Finally, it should be mentioned that the theoretical aspects of isotope separation formed a delicious side dish of the most impressive "Symposium-menu". Lectures by Bigeleisen, McInteer, London, Kuhn, Johns and others told of the many activities proceeding. Let us hope that they will earn their due place in forthcoming symposia.

European Symposium on Chemical Engineering

The First European Symposium on Chemical Engineering dealing with the subject "Chemical Reaction Engineering" was held in Amsterdam on 7th, 8th and 9th May and proved to be a great success. There were about 250 participants (half of them Dutch, the others originating from 12 different countries), who were received by the burgomaster of Amsterdam on the evening of May 7th. In his speech the burgomaster stressed the enormous expansion of the chemical industry and the contribution of this Symposium towards its continuous development. Replying to this speech, Professor Letort of the University of Nancy spoke of the co-operation within the European Federation for Chemical Engineering, of which this Symposium, sponsored by the Federation and organized by the Koninklijke Nederlandse Chemische Vereniging and the Koninklijk Instituut van Ingenieurs, was a striking manifestation.

The scientific part of the Symposium, in which an animated exchange of thought took place, was marked by the considerable contribution of the Dutch chemical industry. The hope is expressed that in future industries abroad will also be more inclined to take an active part in this kind of symposium, as this will prove a great stimulus to the development of chemical engineering as a branch of science, the fruits of which will be reaped by the chemical industry itself.

The papers presented at the Symposium were printed by Pergamon Press Ltd. in London. The complete PROCEEDINGS of the Symposium will be published as a special supplement to the periodical "Chemical Engineering Science" (publisher: Pergamon Press Ltd., 4 Fitzroy Square, London W.1).

In addition, a 5000 word report will appear in Dutch (in "De Ingenieur"), English (in "Chemical Engineering Science"), French and German.

International Seminar on Regional Planning and Development

The International Seminar on Regional Planning and Development, organized by NUFFIC and announced in Vol. 1, No. 1 of our Bulletin, was held in the former Royal Palace at the Hague from July 1 to July 6 last.

During the week in question some seventy planning experts, economists, sociologists, geographers and agriculturalists from many countries of the world, including representatives of the United Nations, the U.N. Food and Agricultural Organization and Unesco, made a joint study of the framing and execution of development plans for areas, some of which represented parts of national states and other whole countries put together.

The Seminar, which was under the general direction of Dr. R. A. J. van Lier, professor in the Agricultural University at Wageningen, was opened by Dr. H. J. Reinink, Director-General for Arts and External Cultural Relations, on behalf of the Netherlands Minister of Education, Arts and Sciences. Dr. S. L. Mansholt, the Netherlands Minister of Agriculture, Fisheries and Food, then introduced the first main subject, entitled "Planning as a Process in the Development of Society".

In the other planning sessions the following main subjects were dealt with successively by a number of prominent experts in the field of planning:

"History of the Development of Planning", by Prof. Dr. L. Dudley Stamp of the London School of Economics, University of London;

"The Concept of the Region", by André Prothin, Director-General of Regional Planning in France;

"Planning as an Operation", by Prof. Dr. K. Brüning, President of the German Academy of Regional Development and Provincial Planning at Hanover;

"The Planning Team", by Dr. L. Silberman of Balliol College, Oxford, and

"The Execution of the Plan", by S. Herwyer, Engineer and Director of the Department of Land and Water Use, Ministry of Agriculture, Fisheries and Food, at Utrecht.

Twenty-six brief reports relating to one or more aspects of the above-mentioned subjects were also brought up for discussion during the Seminar.

A one-day excursion was made to the Zuyder Zee Reclamation Works, visits being paid to the East Flevoland Polder, now undergoing construction, and to the North-East Polder, which is already under cultivation. On the final day a further excursion, linking up with the last subject dealt with, viz., "The Execution of the Plan", was made to the land consolidation works in the relatively underdeveloped areas, known as the "River Basin Soils", lying between the rivers Rhine and Meuse.

A better understanding was acquired during these days of study of the kind of difficulties arising out of co-operation among groups of experts of widely different training and function, and the general feeling among those taking part was that a valuable contribution has been made towards overcoming these difficulties.

One of the natural motives for choosing the

Netherlands as the scene for these international consultations was the fact that so much attention is paid in this country to planning, both in theory and in practice, not only in connection with such large projects of more recent date as the reclamation of the Zuyder Zee polders and the Delta Plan, but also as regards development work in the older provinces.

LIBRARIES AND MUSEUMS

The Peace Palace Library

This Library is usually referred to as the Carnegie Library of the Peace Palace, to indicate that it forms part of the Netherlands Carnegie Foundation, a semi-official institution, owning not only the Peace Palace but also its Library. By adopting this name for this well-known international law library, a distinction is made between this public library and the library owned by the United Nations and also housed in the Peace Palace at the Hague, which latter Library is at the disposal of the International Court of Justice only.

The presence in the Peace Palace of highly specialized law collections was originally intended for the use of the building's first inhabitant, the Permanent Court of Arbitration. Only 9 years after the opening of the Peace Palace, the Carnegie Library had won sufficient renown to turn the scales in favour of choosing the Hague as the seat of the new Permanent Court of International Justice (1922), known since 1946 as the International Court of Justice. One year later (1923) the Hague Academy of International Law, with its summer courses, became the third international organization to profit by this "centre of bibliography and documentation". Since then many international conferences have been held at the Peace Palace, which have also made profitable use of the Carnegie Library.

In fact, this library has developed into a more or less public, scientific library, although it has always maintained its special character, in accordance with a gentlemen's agreement between the Carnegie Foundation and the International Court of Justice. This is not the place, however, to examine its special character; the user will soon become aware of this and appreciate the Library's special status amongst other law libraries. Suffice it to emphasize its specialization on international public and private law, although quantitatively its collections on municipal law, its acquisitions in the way of various kinds of periodicals and works on diplomatic history, political science, international organization and relations etc., seem far to exceed the "hard core" of works on international law.

There may be another reason why the Carnegie Library has become an international centre for research, especially for international lawyers, diplomats and international organizations, and that is its very special system of cataloguing. Normally a library disposes of one alphabetical and one systematical catalogue. In the Peace Palace there are five main catalogues and a number of special catalogues for different purposes. There are two alphabetical catalogues, one for the printed cards of book-titles and one for the type-written cards of titles, taken from the periodicals, serial works, collective publications, brochures, extracts, etc. in the library's possession. The same distinction applies to the two systematical catalogues. Both books and articles, etc., are classified according to the same system. This systematical classification has been adapted to the special requirements of the Library and its users; the U.D.C. has never been employed. The fifth, the alphabetical subjects or catch-words catalogues, is not merely a combination of the aforementioned different kinds of cards, but is in fact an independent source of information. Although it is related to the systematical catalogues by its frequent use of references and cross-references, its value lies chiefly in the many thousands of catch-words with their subdivisions and in the introduction of geographical sections, giving a survey of the subjects per country and of the relation with other countries.

Another element conducive to research in international affairs lies in the concentration of documentary and other important material in the reading room and adjoining space. Collections of treaties, national constitutions and law codes, the complete *Recueil des Cours de l'Académie de Droit International*, as well as a selection of international law books are kept there at the reader's disposal. Nearby one finds the Asser Collection, containing the most important books on private international law, and the case-law of the various countries. The reader who prefers to study international organization will find the complete documents of the League of Nations, the United Nations, the Council of Europe, and the European Coal and Steel Community, etc., neatly arranged in separate rooms. In addition, the systematical catalogues contain much documentary information facilitating the use of the documents of these and other organizations.

Thanks to the perseverance of the former

Director-Librarian, Dr. Jac. ter Meulen, the Library has acquired a famous collection of Grotiana, commencing with all the known editions of Hugo Grotius' *De jure belli et pacis*. A bibliography of these Grotiana (*Bibliographie des écrits imprimés de Hugo Grotius*, edited by ter Meulen en Diermanse in 1950) demonstrates the collection's unique value. Following the same line of thought, Dr. ter Meulen aimed at collecting as much pacifist literature as he could lay his hands on, without neglecting the Library's main purpose: the completeness of its international law collections. On the other hand, with a view to making this library more attractive, the practice has always been adopted of acquiring works of a less doctrinal nature, especially in the field of topical studies of a historical, geographical, ethnical, sociological or philosophical character. Finally, personal notes also find a place in the large collection of biographies, autobiographies and memoirs. These are considered to be a necessary complement for the study of international relations and diplomacy.

All this work has been done and is kept up-to-date by a relatively minute staff, which offers a guarantee of efficiency and uniformity but leads in some instances to inevitable restrictions. Thus, it proved impossible to continue the "Central Juridical Catalogues", a systematical classification of all foreign law literature kept at the various law libraries in the Netherlands. The same applies to the discontinuance of the well-known Catalogue of the Peace Palace Library, of which five volumes have appeared (1916–1937). For financial reasons, only the international law section is now being compiled, in stencil-form, covering the period 1937–1952.

In order to make the rich contents of the Peace Palace Library more readily available, it was planned to prepare and publish Selective Bibliographies of the Library's collection. Since the first volume (Fundamentals of Public International Law) appeared in 1953, only two more volumes (Recognition of International Law, 1954, and Immunities in International Law, 1955) have followed, since owing to pressure of work the preparation of further volumes has had to be provisionally postponed. It is to be hoped that a new experiment of the Hague Academy of International Law, the opening of the Centre for Studies and Research in International Law and International Relations (19 August–28 September 1957) may result in the revival of the Carnegie Library's bibliographical activity. International co-operation in this field too would increase the use made of the Library's rich material, which has grown from 100,000 volumes in 1934 to approximately 350,000 volumes in 1956. To quote Mr. Quik's words when referring to the aim of NUFFIC, it would mean: "the encouragement of research in fields of science of high importance to the growth of healthy international relations".[1])

In conclusion, it may be noted that the Peace Palace Library maintains close relations with several governmental departments and international organizations, which are kind enough to supply the Library with their official publications gratuitously. Bibliographical and other services are rendered to some of these bodies in exchange. Particular mention may be made of collaboration on the European Year Book, published under the auspices of the Council of Europe, of which the Director-Librarian, Dr. B. Landheer, is co-editor.

Dr. Landheer represents the Peace Palace Library on many occasions at the international level, such as at Congresses of the Academy of International Law and in the Library's relations with UNESCO and similar bodies.

J. L. F. VAN ESSEN[2])

News from the University Library at Utrecht

Bibliography of Dutch Publications on Portugal

Recently the library has published a book entitled "Bibliography of Dutch Publications on Portugal and Her Overseas Territories", by Dr. W. Kloosterboer.

Very close contacts existed between Dutchmen and the Portuguese in the past, especially during the Golden Age of Netherlands history, while there has been no lack of contact in later ages either. There was every reason, therefore, to see what repercussions these relations have had in literature of all kinds. On the instigation of Dr. A. de Medeiros-Gouvêa, secretary of the Instituto da Alta Cultura in Lisbon, Miss W. Kloosterboer, a doctor of literature on the scientific staff of the University of Utrecht library, has accordingly undertaken the task of investigating these reactions. With a list of 1622 items, the bibliography provides a survey of what Dutchmen have written about the language, literature, history and the country and people of Portugal and her overseas territories.

The volume has been put on the market by the publishing firm of Martinus Nijhoff of the Hague.

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[1]) See Higher Education and Research in the Netherlands, vol. I, no. 1, 1957, p. 3.

[2]) Dr. van Essen is Conservator (Chief Assistant Librarian) of the Peace Palace Library, and lecturer in international law at the University of Utrecht.

MISCELLANEOUS

PROGRAMMA

Certaminis poetici ab Academia Regia Disciplinarum Nederlandica ex Legato Hoeufftiano in annum MCMLVIII indicti

De carminibus duodetriginta ita est iudicatum:

Praemium aureum reportavit carmen c.t. *Smaragdus;* auctorem se professus est FERDINANDVS MARIA BRIGNOLI. Sumptibus Legati in volumen recipientur carmina q.t. Nova de re rustica inventa, Decipit frons prima multos, Minios aemulus, si eorum poetae scidularum aperiendarum dederint veniam.

Sequuntur omnium carminum nomina:

1. Ad C. Iulium Cæsarem. 2. Lodoix. 3. Post Catullocalvom. 4. Castellum et captivus. 5. Campania vere felix ! 6. Matronius et Luella. 7. Baptisma. 8. Andium laudes. 9. Decipit frons prima multos. 10. Nocturna contemplatio. 11. Recordationes. 12. Nova de re rustica inventa. 13. Candida pax. 14. Primogenitus. 15. Smaragdus. 16. Amarum cor. 17. Eryx sive siculum carmen. 18. Medeæ animi motus Iasonis studio flagrantis. 19. Trimembre sidus. 20. Timoleon. 21. Olea 22. "Pippo" seu avis nocturna. 23. Ad amicum rus proficiscentem. 24. In Aventino monte. 25. Minois æmulus. 26. Piscatores (Magister et Discipulus). 27. Festiva infantis hora. 28. Musca et poeta.

Ad novum certamen cives et peregrini invitantur his legibus, ut carmina latina non ex alio sermone versa nec prius edita argumentive privati nec quinquaginta versibus breviora[1]), nitide et ignota iudicibus manu scripta ante Kal. Ian. A. MCMLVIII mittantur ad "het Bestuur der Koninklijke Nederlandse Akademie van Wetenschappen, Trippenhuis, Amsterdam", munita sententia, item inscribenda scidulae obsignatae, quae nomen et domicilium poetae indicabit. Ceterum iudicibus gratum erit, si poetae in transscribendo portabile prelum britannicum *(type-writer)* adhibuerint, ac si, quemadmodum in editionibus poetarum fieri solet, sextum quemque versum numero insigniverint.

Praemium victoris erit nummus aureus quadringentorum florenorum. Carmen praemio ornatum sumptibus ex Legato faciendis typis describetur eique sibiungetur alterum laude ornatum, si scidulae aperiendae venia dabitur. Id autem ante Kal. Iul. proximas fieri debebit. Exitus certaminis postremum in conventu Ordinis mense Aprili pronuntiabitur, quo facto scidulae carminibus non in volumen receptis additae Vulcano tradentur.

H. DOOYEWEERD
Ord. lit. Acad. Reg. ab actis.

Amstelodami, Kal. Mai. A. MCMLVII

New foreign members of the Royal Academy of Sciences and Humanities

The nomination of the scholars, Jean Pommier, of France, and Kurt Latte, of Germany, as foreign members of the Royal Academy of Sciences and Humanities has been confirmed by royal decree.

Dr. KURT LATTE was born in 1891. He is professor of classical philosophy in the University of Göttingen and the first scholar of German nationality to be nominated as a foreign member of the Royal Academy since the second world war. It should be mentioned that he was exposed to persecution in Germany during the war and had to go underground for a considerable time in Hamburg. Dr. Latte can probably be regarded as the most original and versatile student of classical antiquity of our time. He has rendered great services in the promotion of international relations in the academic world.

Dr. JEAN POMMIÉR, now in his sixties, commenced his academic career as a lecturer at Amsterdam, was appointed soon afterwards to a professional chair at Strasbourg and later at the Sorbonne. He is at present a professor at the Collège de France. Mr. Pommier is the most important living historian of French literature.

Canadian Government Overseas Awards

Among the winners of the Canadian Government Overseas Awards for the year 1957–1958 is E. W. Guptill, Professor of Physics, Dalhousie University, who will study low temperature problems at the State University at Leyden.

Among last year's winners was Prof. H. Kleerekoper, Chairman of the Department of Biology, McMaster University, Hamilton; Prof. Kleerekoper conducted physiological research in the Zoological Laboratory of the State University at Groningen and has been preparing a publication on a limnological subject. The Canadian Government Overseas Awards are tenable in the United Kingdom, France, Italy and the Netherlands. They are open to Canadian citizens and awarded annually by the Royal Society of Canada. Fellowships are worth $ 4,000 each, Scholarships $2,000 each. Both the abovementioned scientists have been awarded fellowships.

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[1]) Quod ad carminum longitudinem solus hic terminus condicionibus legati Hoeufftiani constitutus est. Licet igitur in posterum quoque sua libertas constet poetis, iudices Hoeufftiani permagni facient si, quoad fieri possit, carmina numerum quadringentorum utique versuum non excedent.

DOCTORAL DISSERTATIONS

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With a summary in German.
University of Amsterdam.

LOMBARD, J. C. *Die leer van die heiligmaking by Karl Barth;* (The Doctrine of Sanctification in the Works of Karl Barth). Kampen, 1957.
Free (Reformed) University of Amsterdam.

PETERS, P. A. *Geloof en mystiek. Een theologische bezinning op de geestelijke leer van Sint-Jan van het Kruis;* (Faith and Mysticism. Theological Reflections on the Teachings of St. John of the Cross). Louvain, 1957.
Roman Catholic University at Nymegen.

RIETVELD, B. *Saecularisatie als probleem der theologische ethiek. Inzonderheid in verband met gedachten van Dietrich Bonhoeffer en Friedrich Gogarten;* (Secularization as a Problem of Theological Ethics. With special reference to the ideas of Dietrich Bonhoeffer and Friedrich Gogarten). The Hague, 1957.
Free (Reformed) University of Amsterdam.

SOEDARMO. *In de wereld maar niet van de wereld. Een studie over de grondgedachten van de theologie van Friedrich Gogarten;* (In the World but not of the World. A study of the basic principles of Friedrich Gogarten's theology). Kampen, 1957.
With a summary in German.
Free (Reformed) University of Amsterdam.

Law

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HOEFNAGELS, G. P. *Rapportage in het civiele kinderrecht in het bijzonder bij de raden voor de kinderbescherming;* (Reporting in Civil Law relating to Juveniles, in particular in the case of Child Protection Councils). Assen, 1957.
With a summary in English.
State University at Utrecht.

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State University at Utrecht.

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With a summary in Dutch, English and German.
University of Amsterdam.

Medicine

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With a summary in German and English.
State University at Groningen.

AUSEMS, M. M. *De cystometrie. Haar betekenis voor het onderzoek en de therapie bij functiestoornissen van de blaas;* (Cystometry. Its significance to investigation and therapy in the case of functional disorders of the bladder). 's-Hertogenbosch, 1957.
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State University at Leyden.

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With a summary in English, French and German.
State University at Utrecht.

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With a summary in English.
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State University at Utrecht.

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With a summary in English.
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With a summary in English.
State University at Utrecht.

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University of Amsterdam.

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State University at Utrecht.

SCHOLARSHIPS AND FELLOWSHIPS FOR FOREIGN STUDENTS, TENABLE IN THE NETHERLANDS[1]

Government of the Netherlands

Ministry of Education, Arts and Science, The Hague.
Exchange Scholarships of the Netherlands.
Netherlands-Belgian Cultural Convention.

1. Unrestricted.
2. Netherlands.
3. Available to *Belgian* nationals; must have university degree or have completed several years' higher study.
4. Fl. 185 per month plus tuition.
5. 1 to 6 months[1].
6. The Convention provides for exchanges of approx. 90 months; number awarded depends on the duration of each scholarship[2].
7. Ministère de l'Instruction Publique, Brussels, Belgium, in May.

Government of the Netherlands

Ministry of Education, Arts and Sciences, The Hague.
Exchange Scholarships of the Netherlands.

a. Anglo-Dutch Cultural Convention.
b. Netherlands-French Cultural Convention.

1. Unrestricted.
2. Netherlands.
3. Available to *a. British* nationals; must have a university degree or have completed several years' higher study; *b.* nationals of *France* who have completed several years' higher study.
4. Fl. 250 per month plus tuition.
5. *a.* 1 academic year; *b.* 1 to 6 months.
6. *a.* 5[2]; *b.* the Convention provides for exchanges of approx. 90 months; number awarded depends on the duration of each scholarship[2].
7. *a.* The Controller, Education Division, The British Council, 65 Davies Street, London, W. 1 England, by March 12;
   b. Office National des Universités et Ecoles Françaises, 95 Boulevard Raspail, Paris-6e, France, in May.

Government of the Netherlands

Ministry of Education, Arts and Sciences, The Hague.
Netherlands Government Scholarships.

1. Unrestricted.
2. Netherlands.
3. Available to nationals of *a.* Australia; *b.* Austria; *c.* Canada; *d.* Denmark; *e.* Germany; *f.* Iceland; *g.* India; *h.* Israel; *i.* Norway; *j.* Spain; *k.* Sweden; *l.* Yugoslavia; must have university degree or have completed several years' higher study.
4. ± Fl. 2500 plus tuition.
5. 1 academic year.
6. *a.* 3; *b.* 2; *c.* 1; *d.* 1; *e.* 3; *f.* 1; *g.* 1; *h.* 1; *i.* 2; *j.* 1; *k.* 1; *l.* 1.
7. *Australia:* Office of Education of the Commonwealth of Australia, Canberra; *Austria:* Bundesministerium für Unterricht, Minoritenplatz 1, Vienna; *Canada:* Department of External Affairs, Ottawa; *Denmark:* Ministry of Education, Copenhagen; *Germany:* Deutscher Akademischer Austauschdienst, Nassestrasse 11a, Bonn; *Iceland:* Ministry of Education, Reykjavik; *India:* Ministry of Foreign Affairs, New Delhi; *Israel:* Netherlands Legation, Jerusalem; *Norway:* Kontoret for culturelt samkven med utlandet, Oslo; *Spain:* Direccion General de Relaciones Culturales, Madrid; *Sweden:* The Swedish Institute, Kungsgaten 42, Stockholm; *Yugoslavia:* Commission for Foreign Cultural Relations, Bircaninova 6, Belgrade.

Government of the Netherlands

Ministry of Education, Arts and Sciences, The Hague.
Exchange Scholarships of the Netherlands.
Cultural Convention with Luxembourg.

1. Unrestricted.
2. Netherlands.
3. Available to nationals of *Luxembourg;* must have completed several years' higher study.
4. Fl. 225 per month plus tuition.
5. 1 to 3 months[1].
6. The Convention provides for exchanges of approx. 8 months; number awarded depends on the duration of each scholarship[2].
7. Ministère de l'Education Nationale, Luxembourg.

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[1] The figures in the margin refer to: 1: field of study; 2: where tenable; 3: conditions; 4: value; 5: duration 6: number available; 7: address for applications.
A "1" added after the duration of the scholarship indicates that it is renewable or extendible. A "2" added after the number of scholarships available indicates that the same award will be offered for 1957–'58.

Government of the Netherlands

Ministry of Education, Arts and Sciences, The Hague.
Exchange Scholarship of the Netherlands. Cultural Convention with Italy.

1. Unrestricted.
2. Netherlands.
3. Available to nationals of *Italy*, must have university degree or have completed several years' higher study.
4. Fl. 250 per month plus tuition.
5. 8 months.
6. 3[2].
7. Direzione Generale delle Relazioni Culturali, Ministere degli Affari Esteri, Piazza Firenze 27, Rome, Italy.

Government of the Netherlands

Ministry of Education, Arts and Sciences, The Hague.
Netherlands Government Scholarships.

1. Unrestricted.
2. Netherlands.
3. Available to *South African* graduates and undergraduates.
4. Fl. 2.500 plus tuition.
5. 1 academic year.
6. 10[2].
7. Genootschap Nederland-Suid-Afrika, p/a Prof. Dr. D. Pont, Waterkloofweg 266, Pretoria, South Africa.

Government of the Netherlands

Ministry of Education, Arts and Sciences, The Hague.
a. Hendrik A. van Coenen Torchiana Scholarship. *b.* Edward W. Bok Scholarship. *c.* Hendrik Willem van Loon Scholarship.

1. Unrestricted.
2. Netherlands.
3. Available to nationals of U.S.A.; age preferably under 28; must have bachelor's degree; applicants in the field of medicine must have M.D. degree; some knowledge of Dutch language desirable.
4. Fl. 2.000 plus tuition.
5. 1 academic year.
6. *a.* 1[2]; *b.* 1[2]; *c.* 1[2].
7. U.S. Student Department, Institute of International Education, 1 East 67th Street, New York 21, N.Y., U.S.A. by 1 March.

Government of the Netherlands

Ministry of Education, Arts and Sciences, The Hague.
Scholarships for Netherlands Summer Courses.

1. Subjects included in Dutch university summer courses.
2. Netherlands.
3. Available to nationals of *Italy* and *Spain.*
4. Fl. 400.
5. 1 month.
6. 7[2]: 3 to Italy; 4 to Spain.
7. *Italy:* Direzione Generale delle Relazioni Culturali, Ministero degli Affari Esteri, Piazza Firenze 27, Rome;
   Spain: Dirección General de Relaciones Culturales, Madrid.

Government of the Netherlands

Ministry of Education, Arts and Sciences, The Hague.
Unesco-Netherlands Government Fellowships.

1. Natural sciences, cultural activities.
2. Netherlands.
3. Available to nationals of *Ceylon, Turkey* and *Venezuela;* should be mature, already established in their professions; must have knowledge of Dutch, English, French or German. Awards are granted for study at universities or institutions of university level.
4. Fl. 2.250 plus tuition fees and other facilities.
5. 6 months.
6. 3 (1 to each country).
7. Ministry of Education or Ministry of Foreign Affairs in candidate's own country.

Free (Reformed) University of Amsterdam

162, Keizersgracht, Amsterdam.
Scholarships.

1. Theology, philosophy, arts, medicine, law, natural sciences (chemistry, physics, mathematics, biology), social and economic sciences.
2. Netherlands: Free Reformed University of Amsterdam.
3. Available to nationals of *all countries;* must be educated to university entrance standard. Awards are to enable recipients to acquire academic knowledge based on Christian principles.
4. Maintenance, tuition and an amount for incidental expenses.
5. 1 academic year.
6. 4[2].
7. Secretary of the International Relations Committee, Vrije Universiteit te Amsterdam, Keizersgracht 166, Amsterdam, April 15.

French Institute in Amsterdam

Maison Descartes, 11, Museumplein, Amsterdam.
Donor: French Government.
Research Fellowships.

1. Unrestricted.
2. Netherlands: Maison Descartes, Amsterdam.
3. Available to *French* nationals engaged in study or research work for which documentation is available only in the Netherlands. Candidates must submit a plan of study with their applications.
4. Fl. 325.— (covers maintenance); room provided at Maison Descartes; transportation Paris-Amsterdam in certain cases.
5. 1 to 10 months, between October 1 and July 31.
6. Unspecified[2] (grants awarded are for a total of 50 months).
7. M. Henri Gouhier, professeur à la Sorbonne, 21 Boulevard Flandrin, Paris-16e, France, by May 1.

Hague Academy of International Law

Peace Palace, The Hague.
Scholarships for the Academy's summer sessions, offered by various governments and by private and public institutions.

1. International law.
2. The Hague Academy of International Law.
3. Applicants' antecedents should qualify them to benefit from the tuition.
4. in 1957: Fl. 300, covering approximate expenses during the four-week session.
   Travelling expenses will not be refunded.
5. July 15 – August 10, 1957.
6. No more than two scholarships can be awarded in respect of each country during the same year. This rule does not apply to scholarships instituted in a country for the benefit of its nationals, the award of which has been entrusted to the Curatorium of the Academy.
7. Secretariat of the Hague Academy of International Law, The Peace Palace, The Hague, before April 1.

Netherlands Organization for Pure Scientific Research

60, Lange Voorhout, The Hague.
Exchange Fellowships for Scientific Research.

1. Scientific research.
2. Netherlands.
3. Available to *French* nationals who are scientific research workers of proven ability, in exchange for similar facilities for Netherlands research workers offered by the National Council for Scientific Research in Paris.
4. Covers transportation, maintenance and research facilities.
5. Varies in individual cases.[1]
6. Unspecified[2]; as the convention between the Netherlands and the CNRS provides for exchanges of 30 months of fellowships in an academic year, number awarded depends on duration of each award.
7. Monsieur le Directeur du CNRS, 4e Bureau Echanges, 13 quai Anatole-France, Paris-7e, France.

Netherlands Universities Foundation for International Co-operation

27, Molenstraat, The Hague.

a. Scholarships for study at the Institute of Social Studies; *b.* Fellowships for study at the Institute of Social Studies; *c.* A limited number of other scholarships and fellowships.

1. *a.* Social Sciences (Two-Year Course),
   b. Public Administration,
   c. Unrestricted.
2. *a–b.* Institute of Social Studies, The Hague,
   c. The Netherlands.
3. Available to nationals of *all countries;* candidates must have for *a.* M.A. degree in social sciences, or its equivalent; for *b.* graduate (or equivalent) intellectual standard at and preferably some years of experience at middle or higher level of the public service; for *c.* advanced graduate status.
4. *a.* Fl. 6080 (Two-Year Course in the Social Sciences),
   b. Fl. 2100 (Six-Month Course in Public Administration),
   c. Unspecified.
5. *a.* 16 months; *b.* 6 months; *c.* unspecified.
6. Unspecified[2].
7. *a–b.* The Rector, Institute of Social Studies, 27, Molenstraat, The Hague: *a.* by 30 June; *b.* by 15 October; *c.* Netherlands Universities Foundation for International Co-operation, 27, Molenstraat, The Hague.

Utrecht Observatory

2, Zonnenburg, Utrecht.
Exchange Assistantship.

1. Astronomy.
2. Netherlands: Utrecht Observatory.
3. Available, on an exchange basis, to students of theoretical or observational astrophysics in *any country*.
4. Exchange of salary.
5. Approx. 3 months.
6. 1[2].
7. Utrecht Observatory, University of Utrecht, 2, Zonnenburg, Utrecht.

BASIC DATA ON INTERNATIONAL COURSES OFFERED IN THE NETHERLANDS[1])

(see also the "International Courses" Section in this Bulletin)

Institute of Social Studies

Information: The Rector, Institute of Social Studies, 27, Molenstraat, The Hague.

COURSES OFFERED:

a. Two-year Course in the Social Sciences. The study of social change and economic development in the widest sense. The course leads to the degree of Master of Social Sciences.
REQUIREMENTS FOR ADMISSION: Advanced academic standing in one of the social sciences.
NEXT COURSE STARTING: September 1958. Closing date for applications: June 30, 1958.

b. Six-Month Advanced Diploma Course in Public Administration.
REQUIREMENTS FOR ADMISSION: Advanced academic status and preferably some years of experience in the public service.
NEXT COURSE STARTING: January 1958. Closing date for applications: October 15, 1957.

c. Six-Month Advanced Diploma Course in Economic Planning and Social Accounting.
REQUIREMENTS FOR ADMISSION: Advanced academic status and preferably some years of experience in the public service.
NEXT COURSE STARTING: January 1958. Closing date for applications: October 15, 1957.

d. Six-Month Advanced Diploma Course in Social Welfare Policy for Low Income Countries.

REQUIREMENTS FOR ADMISSION: Practical experience in social work, preferably at the teaching and public service level.
NEXT COURSE STARTING: September 1958. Closing date for applications: June 30, 1958.

International Training Centre for Aerial Survey

Information: The Dean, International Training Centre for Aerial Survey, 3, Kanaalweg, Delft.

COURSES OFFERED:

a. Photogrammetry, including cartography, topography and theory of errors;

b. Photogeology;

c. Use of air photographs for soil survey and other agricultural purposes;

d. The same for forestry and other sylvicultural purposes;

e. Air photography and survey navigation.
Lectures and instruction are given in English, French or German.
Courses are adapted to individual needs, and may therefore vary from some months to two years.

REQUIREMENTS FOR ADMISSION: Dependent upon the individual student's programme of study: NEXT COURSE(S) STARTING: September and January.

Technological University at Delft, Netherlands Universities Foundation for International Co-operation

Information: Netherlands Universities Foundation for International Co-operation, 27, Molenstraat, The Hague.
COURSE OFFERED:
International Course in Hydraulic Engineering. Three branches of study:

1. Tidal and coastal engineering;
2. Reclamation;
3. Rivers and navigation works.

The course lasts twelve months and leads to a Diploma.

REQUIREMENTS FOR ADMISSION: a degree in engineering of a recognized institution of higher learning. *Next course starting:* October 1957 (at Delft).

Training Courses and Research Foundation

Information: Training Courses and Research Foundation, 76, Nieuwe Laan, Delft.

COURSE OFFERED:

International Course on Small-Scale Industries. Theoretical and practical training in investigating and solving the specific problems of small-scale industries, and in finding a methodology which can be applied to the establishment of new industries. Successful attendance of the course leads to a diploma.

REQUIREMENTS FOR ADMISSION: B.Sc. or M.Sc. in engineering or equivalent degree of recognized universities.

Next Course: November 1957 until end of April 1958.

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[1]) Courses are given in English only, unless otherwise mentioned.

CALLING ALL REGISTRARS OF INSTITUTES OF HIGHER EDUCATION AND RESEARCH IN ALL COUNTRIES

NUFFIC is being approached by a growing number of Dutch students and graduates desiring to continue their studies with the request for information concerning the possibilities of studying and carrying out research work in other countries.

In order to be able to deal competently with the requests, NUFFIC has an immediate need of information concerning the training and research facilities available, courses and special subjects offered, requirements of admission etc., etc., from as many universities abroad as possible.

An appeal is therefore being made to all registrars of institutes of higher education and research abroad to put NUFFIC on their mailing lists so that we may receive copies of their calendars, announcements and prospectuses.

NUFFIC's address is:

NETHERLANDS UNIVERSITIES FOUNDATION FOR
INTERNATIONAL CO-OPERATION,
27, Molenstraat, the Hague, the Netherlands.

The following Netherlands Universities participate in the Netherlands Universities Foundation for International Co-operation:

State University at Leyden
State University at Groningen
State University at Utrecht
University of Amsterdam
Free (Reformed) University of Amsterdam
Roman Catholic University at Nymegen
Technological University at Delft
Agricultural University at Wageningen
Netherlands School of Economics at Rotterdam
Roman Catholic School of Economics at Tilburg

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